SCIENCE

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THE UNITED STATES NAVAL OBSERVATORY.

ALTHOUGH much interest was shown by individuals in the science of astronomy in the early history of our country, this interest did not culminate in the founding of any astronomical observatories until the third and fourth decades of the present century. About 1835 Professors Olmsted and Loomis observed Halley's comet with a five-inch telescope placed in the steeple of one of the buildings of Yale College at New Haven, Connecticut, but the observatory erected by Professor Albert Hopkins of Williams College, in 1836, was probably the earliest establishment of the kind in the United States. It was 48 feet long by 20 in breadth, and consisted of a central apartment surmounted by a revolving dome and flanked by two wings. The dome contained an equatorially mounted Herschelian telescope of 10-feet focus, and a 3.5-inch transit instrument was set up in one of the wings. Only two years later Professor Loomis built a small observatory at Hudson, Ohio, and furnished it with a 4-inch equatorial telescope and a 2.7-inch transit circle. The longitude and latitude of this observatory was determined by Professor Loomis, and he observed five comets and sixteen occultations in the brief intervals of leisure left from his regular class work in the Western Reserve College. Another indication of the zeal of individuals in the advancement of science by actual astro-

nomical observation is shown by a paper published in the 'Transactions' of the American Philosophical Society, New Series, Vol. VII., pp. 165–213, detailing observations of nebulæ made by H. L. Smith and E. P. Mason at New Haven, Connecticut, with a 12-inch reflector. This memoir contains carefully executed plates of several nebulæ, on which the stars are accurately plotted.

Among those in our country who repeatedly urged the foundation of an astronomical observatory in the United States was John Quincy Adams. While Secretary of State, as early as 1823, he offered personally to contribute $1,000 towards the establishment of an astronomical observatory in connection with Harvard College, provided the requisite amount for completing the work should be raised within two years, but this effort failed. In 1825, in his first message to Congress after becoming President of the United States, he made recommendations for the establishment of a national observatory, a uniform standard of weights and measures, a naval academy, a nautical almanac and a national university. Party rancor prevented the carrying-out of any of these far-reaching plans at that time, but all of them, except that of a national university, were executed by our government at a later date. It was some years after this notable message of President Adams before Emperor Nicholas, of Russia, entered upon the preliminary steps which culminated in the creation of the celebrated Pulkowa Observatory.

Even after leaving the Presidential chair, President Adams never once relaxed his efforts towards the founding of a national observatory. In 1838 our Minister to England announced that he had received the money bequeathed to the American people by James Smithson for the increase and diffusion of knowledge among men. Mr. Adams immediately urged that this fund should be devoted to the founding of an astronomical observatory and a nautical almanac, and, as chairman of the select committee on the Smithson fund, he advocated that plan on three different occasions between 1838 and 1842. It is interesting to note that Senator Preston, of South Carolina, violently opposed these recommendations of Mr. Adams, but that in 1842 Mr. Preston gave the weight of his influence in favor of the bill which finally created a national observatory under the name of 'A Depot of Charts and Instruments of the Navy of the United States.' Let us trace the circumstances leading up to this event.

In 1830, under orders from the Navy Department, Lieutenant Goldsborough established a depot of charts and instruments in the western part of the City of Washington, in the square bounded by 24th and 25th Streets, Pennsylvania Avenue and K Street Northwest. Here, in a small circular building, on a brick pier with a foundation 20 feet below the surface, he mounted a 30-inch transit instrument made by R. Patten, of New York City. Goldsborough was succeeded in 1833 by Lieutenant Wilkes, who removed the depot to a site on Capitol Hill, on the west side of North Capitol Street, between B and C Streets north, about 1,200 feet, north, 5° west, from the center of the Capitol. The dimensions of the small observatory erected by Lieutenant Wilkes were 14 feet by 13 feet, and 10 feet from the floor to the eaves, and its outfit was as follows: A transit instrument of $3\frac{3}{4}$ inches' aperture and 63 inches' focal length, made by Troughton under Hassler's direction for the U. S. Coast Survey in 1815, which was loaned to the Navy Department and mounted on massive piers. A Borda's circle presented by Troughton to Mr. Hassler in 1815; a $3\frac{1}{2}$-foot achromatic portable telescope by Jones; a portable transit instrument made by Richard Patten, and a sidereal clock. The Patten transit instrument had previously been

mounted by Lieutenant Goldsborough in the depot of charts and instruments established by him, and was now mounted near the south door of the observatory for the use of the assistants. The sidereal clock was bolted to the western pier of the Troughton transit instrument, but it never performed satisfactorily.

On assuming command of the United States Exploring Fxpedition, in 1838, Lieutenant Wilkes turned over the direction of this observatory to Lieutenant J. M. Gilliss. To perfect and complete the instrumental outfit Gilliss was permitted by the Navy Department to order the following instruments: From Parkinson and Frodsham, of London, a sidereal clock and a meantime clock; from Ertel and Son, of Munich, a meridian circle of 4.5 inches' aperture, furnished with circles 30 inches' in diameter, one of which was graduated to three minutes; from William Simms a portable achromatic telescope of 3¼ inches' aperture and 42 inches' focal length. On the parapet of the Capitol building a south meridian mark was made, which was viewed by reducing the aperture of the transit instrument to 0.9 inch, and at a distance of 2,302 yards a north mark was erected, which could be viewed with the full aperture of the transit instrument. The north mark consisted of an obelisk of sandstone 18 feet high and 14 inches square at the top, having painted on its south face five black lines, three inches apart.

Up to 1838 the work at the 'Depot of Charts and Instruments' consisted of such astronomical observations as were needed for the rating of chronometers. In the beginning of that year instructions, prepared by Lieutenant Charles Wilkes, were transmitted through the Navy Department to Lieutenant Gilliss, directing him to cooperate with the United States Exploring Expedition during the years 1838 to 1842 by systematically observing the following named objects: (1) The Moon and moon-culminating stars. (2) Falling stars, particularly the periodic ones in November. (3) All eclipses of the Sun and Moon. (4) Eclipses of Jupiter's satellites. (5) Occultations of the larger stars. In addition to the work required by these instructions Lieutenant Gilliss determined the right ascensions of 1,248 stars, which were reduced to the epoch January 1, 1840, compared with the right ascensions of the British Association Catalogue and published in 1846 in an 8vo. volume of astronomical observations containing xxv+671 pages. During the years 1840 to 1842 Gilliss also made at the 'Depot of Charts and Instruments,' a fine series of magnetic observations, which were published in 1845 in an 8vo. volume of xxviii+648 pages.

The facilities for scientific work at the little observatory on Capitol Hill were very limited, but Gilliss used them most assiduously. He endeavored by actual achievement to demonstrate to the Navy Department and to Congress the desirability of providing an observatory especially equipped for executing the most refined astronomical work, and in this he was successful. On the 15th of March, 1842, the House Committee on Naval Affairs reported to the House of Representatives a bill 'to authorize the construction of a Depot for Charts and Instruments of the Navy of the United States,' together with a written report which stated at some length that the present 'Depot' and its observatory are inadequate for the purposes intended, and are unsafe for the protection of the valuable instruments; that we are indebted to other nations for the data which enable our vessels to cross the ocean; that an observatory is absolutely essential to the performance of the duties which devolve upon the 'Depot;' that the existing observatory was erected at private expense, and that facilities should be provided for the execution of magnetic

observations. The wording of the bill which accompanied the report and became a law August 31, 1842, was as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That the Secretary of the Navy be and he is hereby authorized to contract for the building of a suitable house for a depot of charts and instruments of the Navy of the United States on a plan not exceeding in cost the sum of twenty-five thousand dollars.

"And be it further enacted: That the sum of ten thousand dollars be and is hereby appropriated of any money in the Treasury not otherwise appropriated towards carrying this law into effect.

"And be it further enacted: That the said establishment may be located on any portion of the public land in the District of Columbia which the President of the United States may deem suited to the purpose."

The Secretary of the Navy immediately placed the preparation of the plans for the new observatory in the hands of Lieutenant Gilliss, who, after consulting with astronomers in America, visited Europe to obtain the views of those competent to advise in these matters. In March, 1843, he returned home, having ordered the instruments under authority from the Secretary of the Navy. Only eighteen months were consumed in the erection of the buildings, the mounting of the instruments and the procuring of a library, and on the 7th of February, 1845, Gilliss presented a detailed report of his labors (Senate Document, No. 114, 28th Congress, 2d session, Vol. VII.) which contains a careful description of the buildings and instruments, illustrated by accurate drawings. The site selected for the building was a reservation between 23d and 25th Streets west, extending from E Street north to the Potomac river. The area of the plot was 17.85 acres. The elevation of the ground on the building site was about 100 feet above the Potomac. Gilliss stated that the new equipment was as follows: 1st, an achromatic equatorial telescope by Merz and Mahler, Munich, of 9.6 inches' aperture. 2d, a meridian transit instrument of $5\frac{1}{3}$ inches' aperture by Ertel, of Munich. 3d, a prime vertical transit instrument of 4.9 inches' aperture by Pistor and Martins, Berlin. 4th, a mural circle by Troughton and Simms, London, with a telescope of 4.1 inches' aperture, and a circle 5 feet in diameter divided to 5′ and read by six micrometer microscopes. 5th, a comet seeker of 4 inches' aperture by Utzschneider and Fraunhofer, Munich. 6th, magnetic instruments. 7th, meteorological instruments. 8th, books. In addition to those items purchased, there belonged to the 'Depot of Charts and Instruments' a portable transit and two clocks, purchased by Lieutenant Wilkes for the Exploring Expedition, and a 30-inch transit circle and two clocks ordered by Gilliss for the 'Depot.'

At the close of September, 1844, Gilliss reported the observatory completed, with the instruments mounted and ready for use. On the 1st of October, 1844, Lieutenant M. F. Maury was ordered to take charge of the institution, and directed to remove to it all the nautical books, charts and instruments of the then-existing depot.

In reviewing the history of the Naval Observatory during Maury's administration, we shall first notice the instrumental equipment, in the selection of which it is probable that Gilliss was principally influenced by English advisers. Instrumental construction was just then passing through a critical period. The Observatory of Pulkowa, which was completed in 1838, following the German school of construction, rejected the mural circle, and supplied its place with the celebrated Ertel vertical circle. An Ertel transit instrument and a Repsold meridian circle completed the outfit of Pulkowa for meridian work, and these instruments were amply provided with horizontal collimators and azimuth marks distant 550 feet, which were rendered visible by the interposition of lenses of corresponding foca length. In contrast with this, the Naval

Observatory followed English precedent, and was supplied with a mural circle which remained its principal declination instrument until 1865. The remaining equipment was the Ertel transit instrument, of first-class construction, but without horizontal collimators and azimuth marks; the small Ertel meridian circle, which had been ordered by Gilliss for the Observatory on Capitol Hill; the Pistor and Martins prime-vertical transit instrument, identical in design with the similar instrument at Pulkowa; and the Merz and Mahler equatorial refracting telescope. The Ertel meridian circle showed such serious defects of construction that it was subsequently sold, and the Merz and Mahler equatorial was much smaller than the refractors at Pulkowa and Harvard College Observatories, one of which was erected a little before and the other a little after that at the Naval Observatory. It may also be mentioned that instead of making the walls of its observing rooms of brick, the Naval Observatory might advantageously have followed the example of Pulkowa by making them of wood, the use of sheet metal for such purposes being then unknown.

Now, for a passing glance at the personnel of the astronomical corps, which was composed of three more or less distinct classes, namely, line officers and staff officers of the United States Navy and civilians. After years of persistent labor, Gilliss had created an astronomical observatory only to have it snatched from his grasp when it was ready for work. Lieutenant Matthew F. Maury, who was ordered to take charge of the new 'Depot of Charts and Instruments' as its Superintendent on October 1, 1844, was then thirty-eight years old. He was possessed of great energy, together with a high degree of native ability, and was well versed in naval affairs, but was very scantily informed in regard to the great advances in astronomical science which had recently been made in Europe. From the line of the navy three lieutenants and six midshipmen were detailed as his assistants. These gentlemen entered upon their work with energy, but their tour of duty was so limited by the rules of the Navy Department that they were obliged to return to their nautical work when they had barely familiarized themselves with their astronomical duties. Among their names will be recognized many who at a later date attained distinction during the Civil War. To these line officers were added Professors of Mathematics Coffin, Keith and Hubbard, who were staff officers in the Navy. The corps of Professors of Mathematics in the United States Navy was originally created to supply instructors for midshipmen afloat and ashore, and all of them served in that capacity, until the founding of the Naval Academy in 1845 closed their seafaring career and gave the Navy Department an opportunity to utilize a part of the corps in other duties. Professor Coffin had instructed midshipmen on shipboard for some half dozen years before he was ordered to assist Lieutenant Gilliss in 1843 in fitting up the new Observatory. Hubbard, a recent graduate of Yale College, was appointed Professor of Mathematics, U. S. N., in 1845, and was immediately ordered to the Observatory. Keith, who had just graduated from Middlebury College, Vt., received his appointment as Professor of Mathematics, U. S. N., in 1847. These gentlemen were each possessed of a high degree of mathematical ability and were destined to leave a lasting impress on the work of the Observatory. At that time the only civil appointee attached to the Observatory was Mr. Sears Cook Walker, who was employed as a computer and observer. He was one of the ablest, and certainly the most experienced, of the corps of astronomers, but unfortunate differences with

Lieutenant Maury led to his resignation after a service of only fourteen months. In 1848 Mr. James Ferguson received the civilian appointment of Assistant Observer, and later that of Assistant Astronomer. He proved an indefatigable observer, and the records of the Observatory show a vast amount of valuable and painstaking work with the equatorial by him. In 1851 Professor Yarnall, U.S.N., was ordered to the Observatory, and in the most untiring and conscientious manner he made substantially all the observations obtained with the mural circle and the Ertel transit instrument during the decade from 1850 to 1860. Professor Keith withdrew from the Observatory in 1853, and Professor Coffin was obliged to give up astronomical observing in 1850 on account of an affection of his eyes.

The work of the Observatory as published during Maury's administration is contained in the following volumes: The Observations for 1845, published in 1846; the Observations for 1846, published in 1851; the observations for 1847, published in 1853; the observations for 1848, published in 1856; the observations for 1849–1850 (one volume), published in 1859. It is worth noting that in the published volumes from 1845 to 1848 inclusive the institution is designated as the National Observatory, but on December 12, 1854, the Hon. J. C. Dobbins, Secretary of the Navy, directed that its official designation should be 'The United States Naval Observatory and Hydrographical Office,' and accordingly all subsequent volumes have been issued as the work of the United States Naval Observatory.

The scheme of work arranged by Maury was as follows: To observe regularly in the meridian the positions of the Sun, Moon, planets and moon-culminating stars; to observe α Lyræ regularly with the prime vertical transit, to determine with that instrument the declinations of a catalogue of zenith stars, and to review the Dorpat Catalogue of double stars with the equatorial telescope.

The meridian observations of the Sun, Moon and planets were commenced in 1845 with some degree of ardor, and kept up with decreasing persistency for several years, but after 1850 only a few scattering observations occur in the published records. The prime vertical transit was also employed for a few years, but soon after 1850 it fell into disuse.

The equatorial was used continuously during the entire period from 1845 to 1861. Assistant Astronomer Ferguson had charge of it during a large portion of this time, and the records show an unbroken series of carefully executed observations of comets, minor planets and occultations of stars by the Moon. The assiduity of Ferguson is attested by his discovery of three minor planets, viz: Euphrosyne, No. 31, on September 1, 1854; Virginia, No. 50, on October 4, 1857; Echo, No. 60, on September 14, 1860.

It would be an act of injustice to pass by unmentioned the numerous items of personal work which enrich the published records. In them we find Coffin's refraction tables founded on Bessel; tables for aiding in the reduction of the apparent places of stars to mean places, by Coffin, Keith and Hubbard; an investigation of the latitude of the observatory and a discussion of the errors of standard thermometers, by S. C. Walker; and last, but not least, we must mention S. C. Walker's discovery, on February 4, 1847, that certain stars observed by Lalande at Paris on May 8 and 10, 1795, were the recently discovered planet Neptune; thus extending the observations of that planet over an interval of fifty years, and thereby making the determination of its elements much more precise.

By far the most ambitious task which Maury set for the new observatory was detailed in his letter to George Bancroft, Sec-

retary of the Navy, July 28, 1846. Speaking of the regular work upon the Sun, Moon and planets, he adds: "A regular series of observations is continued on these objects and the time which is not occupied in the round with them has, with your approval, been devoted to cataloguing; to this end a regular and systematic exploration of the whole heavens from 45° south has been commenced, with the intention of penetrating with the telescope every point of space from that parallel of declination up to the north pole, and of assigning position to every star, down to the 10th magnitude, that shall pass through the field of view." The amount of labor involved in this colossal undertaking was entirely beyond the capacity of any one observatory to accomplish in a generation. Maury would never have undertaken it if he had possessed an intimate knowledge of the herculean labor in respect to observation and computation which its execution demanded. The result was that the observation of the zones was continued with some degree of energy through the years 1846, '47, '48 and '49 with the transit instrument, the mural circle and the meridian circle, by some eleven different observers, two of whom were experienced, and the remainder quite inexperienced. The number of observations accumulated unreduced in these four years was fully 38,000. Maury did not publish any results until 1860, when he issued the meridian circle zones observed in 1846, containing about 4,000 observations. The publication of the remaining zone work was delayed until 1873, when it was printed under the supervision of Professor Asaph Hall, who remarks: "On account of the inexperience of some of the observers and the lack of good organization these observations contain many errors, and the whole work needs a careful revision." To furnish material for this revision, four hundred and fifteen zero stars were selected by Professor Hall from the zones, and their places have since been determined, but as yet the revision has not been accomplished. In contrast with this we may recall that during the decade 1850 to 1860 Argelander, of the Bonn Observatory, in accordance with a carefully conceived plan, observed and published the approximate positions of more than 450,000 stars of the first nine magnitudes between 23° of south declination and the north pole of the heavens. Maury failed because his scheme was entirely too herculean to be accomplished with the means at his command, while Argelander achieved success by bringing the scope and precision of his work within the limits possible of execution.

A review of this period would be incomplete without a reference to the invention of the chronographic method of registering star transits and the general application of electro-magnetism to the transmission of time signals for the determination of differences of longitude. Soon after the invention of the telegraph several persons at about the same time conceived the idea of applying its fundamental principles to the transmission of clock signals and the registering of star transits. Among them were Walker, Bache, Bond, Mitchell, Saxton and Locke. Lieutenant Maury became interested in the labors of the last-named gentleman, and induced Congress to appropriate $10,000 on March 3, 1849, to pay Dr. Locke, of Cincinnati, for the construction and use at the National Observatory of a magnetic clock, a fillet chronograph and a cylinder chronograph. These instruments, although not perfect in details, embraced the essential features of the chronographs in actual use at the present time.

We come now to the third period of the history of the Observatory—namely, from Maury's resignation to the removal to the new site. On April 20, 1861, Maury suddenly resigned his commission and went south to join the Rebellion, and on April

23 Commander J. M. Gilliss, who had built the Observatory some sixteen years before, was ordered to assume charge. For ten years previous to his withdrawal Maury had ceased to have an active interest in astronomical work, and had been wholly absorbed in hydrographic studies. Upon the accession of Gilliss new life was immediately infused into the institution. He resumed meridian observations of the Sun, Moon and planets, which had been practically suspended, and made it one of his first tasks to press the completion of all the unfinished work, which had been accumulating since 1852. At the same time he carried on with equal zeal the nautical work of the Observatory, which the Civil War, then just beginning, had very largely increased.

Until June 21, 1866, when the Hydrographic Office was created, an important part of the duties of the Naval Observatory had been to care for and issue to the Navy all charts, sailing directions, compasses, chronometers, sextants, spy-glasses and other nautical instruments. At the date above mentioned the care of all this material, except chronometers, was transferred from the Observatory, but most of it was returned in 1883, and since then the Observatory has had charge of all nautical instruments of the Navy, except charts and compasses. Since January 1, 1884, all chronometers have been regularly subjected to a temperature test ranging from 45° to 95° Fahrenheit.

During the Civil War, from 1861 to 1865, the duties devolving on the Observatory, in connection with the inspection and issue of all varieties of nautical instruments, were especially arduous, and the constant attention of a number of officers was required to supply each of our several hundred war vessels with their needed outfits.

Since August, 1865, in accordance with a plan originated by Professor Harkness, the Naval Observatory has transmitted time signals daily, except Sundays and holidays, over the telegraph lines running into the chronometer room. Up to the latter part of the year 1879 these signals were transmitted by hand, but since that date they have been sent by an automatic apparatus in connection with the transmitting clock devised by Professor J. R. Eastman. Time balls in a large number of the principal cities of the country are dropped by them.

In 1862 Congress authorized the appointment of three civilians, called aids, to assist in meeting the increased demands on the Observatory on account of the war. Some of the changes in the personnel during this period were as follows:

Simon Newcomb was appointed Professor of Mathematics, U. S. N., in 1861; Asaph Hall, William Harkness and J. R Eastman received appointments as aids in 1862. Hall and Harkness were promoted in 1863, and Eastman in 1865, to be Professors of Mathematics, U. S. N. In 1863 the Observatory lost by death the gifted Professor Hubbard, whose labors had been restricted for years by a frail body.

The later additions to the personnel were as follows: Edgar Frisby was appointed Assistant Astronomer in 1868; A. N. Skinner in 1870 and H. M. Paul in 1875. Frisby was promoted to be Professor of Mathematics, U. S. N., in 1878, on the retirement of Professor Yarnall.

Soon after Gilliss' accession to the superintendency it became apparent that in order to meet the demands of science the Observatory needed a first-class meridian circle, and he took steps to remedy this defect in its equipment. The result was the sale of the small Ertel meridian circle, and the mounting in 1865 of a Pistor and Martins meridian circle 8.52 inches' aperture. The Ertel transit instrument was moved to the east wing and the new meridian circle took its place in the west wing.

In 1873 the Observatory received the

great 26-inch eqtatorial refractor by Alvan Clark & Sons, which was then the largest telescope in the world.

A continuous series of Sun, Moon and planet meridian observations was carried on from 1861 to 1865 with the mural circle and the transit instrument. In the beginning of 1866 the new Pistor and Martins meridian circle was put in service, and observations were made with it in the old west transit room until 1869, June 5. It was then removed to the new transit room, where it was used from February 2 to August 15, 1870, when observations were suspended for some repairs on the instrument. They were resumed in 1871, August 1, and then continued until 1891, June 28, when the instrument was dismounted for removal to the new Observatory. In connection with the Sun, Moon and planet observations, there were made on this instrument extensive determinations of the positions of the Ephemeris stars and of large numbers of miscellaneous stars. When the mural circle and transit instrument were relieved of the planet work, Professor Yarnall devoted them to the completion of the determination of the positions of all miscellaneous stars which had been observed with them since 1845. These collected observations form Yarnall's catalogue, which was published later. The equatorials were assiduously employed on the observation of asteroids, comets, occultations, double stars, satellites, and other work for which they were especially adapted.

The annual volumes of observations were published regularly from 1861 to 1890, and the principal memoirs and researches of greater or less extent appearing in them during this period are as follows:

The solar parallax; from equatorial observations of Mars, 8.8415″ by Professor Hall, Washington Observatory 1863, p. XI; from meridian observations of Mars, 8.8310″ by Assistant Astronomer Ferguson, Washington Observations, 1863, p. XI.

Discussion of the solar parallax by all known methods, 8.848″ by Professor Newcomb, Washington Observations, 1865, App II.

A catalogue of the positions of 151 stars in Præsepe by Professor Hall, Washington Observations, 1867, App. IV.

Reports on the solar eclipse of 1869, August 7; Washington Observations, 1867, App. I.

Reports on the solar eclipse of 1870, December 22; Washington Observations, 1869, App. I.

Reports on the solar eclipse of 1873, July 29; Washington Observations, 1876, App. III.

Reports on the solar eclipse of 1880, January 11; Washington Observations, 1876, App III.

The following embrace all of Hall's double-star work with the 26-inch equatorial; Washington Observations, 1876, App IV., and Washington Observations, 1888, App. I.

The time of rotation of Saturn on its axis was determined by Professor Hall by means of an equatorial spot which was visible from 1876, December 7, to 1877, January 2. The period deduced was $10^h14^m23.8^s$ mean solar time. The paper may be found in the *Astronomische Nachrichten* No. 2146.

On the right ascensions of the equatorial fundamental stars, by Professor Newcomb, Washington Observations, 1870, App. III.

Researches on the motion of the Moon, by Professor Newcomb, Washington Observations, 1875, App. II.

The Uranian and Neptunian systems, Professor Newcomb, Washington Observations, 1873, App. I.

The central parts of the nebula of Orion, Professor Holden, Washington Observations, 1878, App. I.

A catalogue of 10,964 stars from observations on the mural circle and transit instrument, by Professor Yarnall, revised edition by Professor Frisby, Washington Observations, 1884, App. I.

A catalogue of 1963 stars observed by Gilliss, at Santiago, Chili, edited by Professor Harkness, 1868, App. I.

Observations and orbits of the satellites of Mars, Washington 1878. This memoir is bound with some copies of Washington Observations, 1875.

The two satellites of Mars were discovered by Professor Hall in August, 1877, with the 26-inch equatorial.

The six inner satellites of Saturn, by Professor Hall, Washington Observations, 1883, App. I.

Saturn and its rings, by Professor Hall, Washington Observations, 1885, App. I.

Observations for stellar parallax, by Professor Hall, Washington Observations, 1883, App. II.

The solar parallax and its related constants, by Professor Harkness, Washington Observations, 1885, App. III.

Reports on the observations of Encke's comet during its return in 1871, by Professors Hall and Harkness, Washington Observations, 1870, App. II.

Chronometer rates as effected by changes of temperature and other causes, by Commander C. H. Davis, Jr., Washington Observations, 1875, App. III.

The following differences of Longitude have been determined between Washington and

Havana, Cuba, Professor Harkness, Washington Observations, 1867, App. I.

St. Louis, Professor Harkness, Washington Observations, 1870, App. I.

Detroit, Mich.
Carlin, Nev.
Austin, Nev.
} Professor Eastman, Washington Observations, 1872, App. II.

Ogden, Utah, Professor Eastman, Washington Observations, 1874, App. II.

Sayre Observatory, South Bethlehem, Pa.; Professor Eastman, Washington Observations, 1875, App. I.

Cincinnati Observatory, Professor Eastman; Washington Observations, 1876, App. IV.

Morrison Observatory, Glasgow, Mo.; Professor Eastman, Washington Observations, 1876, App. V.

Observatory Princeton, N. J.; Assistant Astronomer Paul, Washington Observations, 1878, App. II.

The zone observations made in 1846–1849 were published as follows:

Meridian circle zones observed in 1846 (a separate publication) contains 4,054 stars, 1860.

Mural circle zones 14,804 stars, Washington Observations, 1869, App. II.

Transit zones, 12,033 stars, Washington Observations, 1870, App. IV.

Meridian circle zones observed in 1847, '48, '49, 7,390 stars, Washington Observations, 1871, App. I.

Results of observations made with the transit intrument and mural circle, 1853 to 1860 inclusive, Washington Observations, 1871, App. II.

Report of Lieut. A. G. Winterhalter as delegate of the United States Naval Observatory to the Astrophotographic Congress held in Paris 1887; with a report on European observatories, Washington Observations, 1885, App. I.

Announcement of the discovery in April 1888, and the subsequent determination of the elements, of a new short-period variable star, S Antliæ = No. 3407 of Chandler's catalogue; by Assistant Astronomer H. M. Paul, *Astronomical Journal* No. 215.

A magnetic observatory was arranged by Maury in 1845, but its construction was so faulty and inadequate that its use was soon discontinued. Nothing further was done in reference to magnetic observations until 1887, when the Bureau of Navigation erected on the grounds of the Naval Observatory a complete magnetic outfit which was provided with facilities for obtaining continuous photographic records of declination, inclination and horizontal force. Instruments were also provided for the necessary absolute determinations of the magnetic elements. This magnetic outfit was turned over to the Observatory in July, 1887. Observations were commenced soon after that date, and continued until September, 1892, when the instruments were removed to the new site.

The preparations for the observations of the transits of Venus of 1874 and 1882, by the United States Transit of Venus Commission, were made at the Naval Observatory as the headquarters of the operations of the Commission, but although this work was done principally by Professors Newcomb and Harkness, it was entirely distinct from the work of the Observatory.

During the years 1885, 1886 and 1887 Professor S. J. Brown, U. S. N., was permitted by courtesy of the Superintendent of the Naval Academy to use its 4-inch Repsold meridian circle as an adjunct of the Naval Observatory in making a series of determinations of the positions of the 303 stars which had been selected to serve as the basis of the German Astronomical Society's southern zones.

When it became known that the work of the Naval Observatory would be interrupted by its removal to a new site the trustees of the Washburn Observatory, of Madison, Wis., very considerately offered the free use of the instruments of the Washburn Observatory to the staff of the Naval Observatory during that period. In acceptance of this invitation Professor S. J. Brown went to Madison on the conclusion of his Annapolis work, and from October, 1887, to October, 1890, conducted a series of

observations with the 4.8-inch Repsold meridian circle on the 'zusatz' stars Nos. 337 to 539 of the Berlin Jahrbuch.

Principally through the exertions of Rear Admiral John Rodgers, during his superintendency, Congress purchased a new site for the Naval Observatory on Georgetown Heights in 1881. Appropriations for the construction of new buildings on this site were made by Congress in 1886, plans for them were prepared by the celebrated New York architect, R. M. Hunt, and in the beginning of 1893 they were sufficiently complete to warrant the transfer of the establishment to the new site.

We come now to the fourth period in the history of the Observatory, namely, from its change of location to the present time.

The new site is distant about two miles in a northwesterly direction from the old Observatory, and occupies 69.78 acres on Georgetown Heights, the buildings being situated on ground elevated from 260 to 280 feet above the Potomac River. The shape of the tract is so irregular that its reentrant angles occasionally approach the buildings more closely than is desirable, and, to remedy this, Congress has enacted a law authorizing the laying out of a circle having a radius of one thousand feet about the center of the clock room, and the acquiring for the Observatory of all the land included therein which is not now owned by the government. This consists principally of two tracts, one of 1.70 acres and the other of 7.87 acres, and the area included in the proposed circle will closely equal that of the original irregular tract. The plans adopted for the new Observatory involved the erection of one building principally for offices, and a separate cluster of isolated buildings for the principal instruments. The main building has the library on its eastern end, and a tower for the smaller equatorial on its western end, with an adjoining meridian room still further west. About 410 feet northwest of the center of the main building is the clock room, which occupies the center of the cluster of instrument buildings. It is flanked on the east and on the west by connecting observers' rooms, which the observers occupy in the intervals between observations; the chronographs being installed therein, and the rooms being heated by steam. Twenty-five feet to the east of the east observers' room is the entirely isolated East Transit House, and at the same distance west of the west observers' room is the similarly isolated West Transit House.

Fifty feet to the north of the center of the clock room is the entirely isolated Prime Vertical Transit House; and 175 feet to the south of the clock room is the dome of the 26-inch equatorial, with two connecting rooms for the use of the astronomer in charge. About 275 feet northwest of the center of the clock room is a circular wooden building 11.5 feet in diameter, surmounted by a revolving dome, for the alt-azimuth instrument. Four hundred feet to the southeast of the clock room is mounted the horizontal photoheliograph, and 250 feet south of this is the magnetic observatory. Six hundred and fifty feet north of the main building is the Superintendent's residence, and 250 feet southeast of the library are quarters occupied respectively by the professors of mathematics in charge of the 26-inch equatorial and the 9-inch meridian circle. About 200 feet northeast of the library is the boiler house, where steam is generated for heating most of the buildings on the grounds. The main building and the 26-inch equatorial building are constructed of white marble, but the four transit houses are built entirely of metal, having iron frames, with double walls and roofs of corrugated metallic plates, which have proved very effective in preserving an equality between the outside and inside temperatures. The carefully constructed

foundations for supporting the piers of the instruments are unusually massive and give unsurpassed stability. All the revolving domes and the shutter machinery of the transit houses were made by Warner and Swasey, of Cleveland, Ohio, and operate in the most satisfactory manner.

Passing now to the instrumental equipment, the 9.6-inch equatorial refractor is replaced by a telescope having a 12-inch object-glass made by Clark and equatorially mounted by Saegmüller. This instrument occupies a 26-foot dome on the tower at the west end of the main building. The 26-inch equatorial is provided with a new mounting by Warner and Swasey, and a powerful spectroscope by Brashear. Its dome is forty-five feet in diameter, and is provided with an hydraulic elevating floor having a range of motion of twelve feet. The Ertel transit instrument is remounted without change in the meridian room at the west end of the main building. The Pistor and Martins meridian circle has received the following modifications: The 8.5-inch object-glass of 12-feet focal length has been replaced by a 9.14-inch Clark object-glass of 107 inches focal length, and the tube has been shortened accordingly; the arms for supporting the microscopes have been replaced by a brass alidade, on the edge of which the microscopes may be clamped in any position; the old collimators of $2\frac{1}{8}$ inches aperture have been replaced by new ones of 4 inches aperture, for which new mountings have been provided, and the apertures in the cube of the instrument have been correspondingly enlarged. The shortening of the telescope made it necessary to reduce the height of the piers, and new marble piers have been provided for the collimators. A vertical collimator has also been added, together with a north meridian mark erected at a distance of 380 feet, which is viewed by means of a lens of the same focal length, having an aperture of six inches, and mounted on the north collimator pier immediately below the collimator.

Two new instruments have been provided which were designed solely by Professor William Harkness, and built by Warner and Swasey, viz.: 1. A meridian circle, constructed entirely of steel, which is mounted in the west transit house. The object-glass has a clear aperture of six inches, and the instrument has two circles each 26 inches in diameter and each graduated to two minutes. It is provided with two horizontal collimators 3.5 inches in aperture, a vertical collimator, and a north meridian mark distant 380 feet. The latter is viewed through a lens of corresponding focal length, which is mounted on the north collimator pier immediately below the collimator. 2. The other new instrument designed by Professor Harkness, and built by Warner and Swasey, is the alt-azimuth. This, like the new six-inch meridian circle, is constructed entirely of steel. The aperture of its object-glass is five inches, and the diameters of its vertical and horizontal circles are 26 inches, each being graduated to two minutes.

One of the Transit of Venus 40-foot horizontal photoheliographs is mounted with all its accessories in the location previously indicated, and to the south of it a well designed magnetic observatory has been built, as mentioned above.

From its inception until July 22, 1863, the Naval Observatory was under the Bureau of Ordnance and Hydrography; from July 22, 1863, to July 1, 1889, it was under the Bureau of Navigation; from July 1, 1889, to the present time, it has been under the Bureau of Equipment and Recruiting, whose name was changed July 1, 1890, to the Bureau of Equipment.

Before considering the present organization of the Naval Observatory it will be convenient to give the following list of those who have held the office of Superintendent:

Lieutenant, later Commander, M. F. Maury, October 1, 1844, to his resignation April 20, 1861.

Commander, later Captain, J. M. Gilliss, April 23, 1861, to his death February 9, 1865.

Rear Admiral C. H. Davis, April 28, 1865, to May 8, 1867.

Commodore, later Rear Admiral, B. F. Sands, May 8, 1867, to his retirement February 11, 1874.

Rear Admiral C. H. Davis, February 16, 1874, to his death, February 18, 1877.

Rear Admiral John Rodgers, May 1, 1877, to his death May 5, 1882.

Vice Admiral S. C. Rowan, July 1, 1882, to May 1, 1883.

Rear Admiral R. W. Shufeldt, May 1, 1883, to February 21, 1884.

Commodore S. R. Franklin, February 21, 1884, to March 31, 1885.

Commodore George E. Belknap, June 1, 1885, to June 7, 1886.

Captain R. L. Phythian, November 15, 1886, to June 28, 1890.

Captain F. V. McNair, June 28, 1890, to November 21, 1894.

Commodore R. L. Phythian, November 21, 1894, to July 19, 1897.

Commander, later Captain, C. H. Davis, from July 19, 1897, the present incumbent.

From its foundation until 1894 the Superintendent was the sole head of the Observatory. On March 3, 1847, Congress enacted that he must be either a captain, a commander or a lieutenant in the Navy, but on March 3, 1865, that restriction was repealed, and it was enacted that: "The officer of the Navy employed as Superintendent shall receive as salary only the shore-duty pay of his grade."

The work of the Observatory is distributed under the following Heads of Departments: The Astronomical Director, the Heads of the Departments of Nautical Instruments, of Chronometers and Time Service, and of Magnetism and Meteorology. The duties of these Heads of Departments are as follows:

The Astronomical Director. This office was created by an order of the Secretary of the Navy, September 20, 1894, which defined the duties of the incumbent as follows: The Astronomical Director has charge of and is responsible for the direction, scope, character, quantity and preparation for publication of all work purely astronomical which is performed at the Naval Observatory. He has charge of the 26-inch and 12-inch equatorial telescopes, the 6-inch and 9-inch transit circles, the prime-vertical instrument, the photoheliograph, and all other instruments and accessories used in his department, together with the construction, remounting and repairing of all astronomical instruments placed in his charge. He personally inspects, both day and night, the methods of observation and computation in all the astronomical departments.

The Head of the Department of Nautica Instruments sees that all nautical instruments issued from the Observatory, except chronometers, are thoroughly inspected and tested before issue.

The Head of the Department of Chronometers and Time Service has charge of the chronometers deposited at the Naval Observatory; he inspects, tests, rates and prepares them for issue; he has charge of the transmission of the daily time signals and the apparatus pertaining to them; finally he makes all necessary determinations of local time for use in his department, and for this purpose has the use of the 5-inch Ertel transit instrument, which is mounted in the meridian room at the west end of the main building.

The Head of the Department of Magnetism and Meteorology has charge of all the magnetic and meteorological apparatus and observations.

The Superintendent as commanding officer is charged with the general superintendence and government of the Observatory. The heads of departments, naval officers, assistant astronomers, computers and employes performing duty at the Observatory are subject to him, and he is responsible for the disbursement of all moneys

appropriated by Congress to sustain the Observatory.

The present personnel is as follows: Superintendent, Captain C. H. Davis, U. S. N.; Lieutenant A. N. Mayer, U. S. N., in charge of the chronometers and time service, and also general storekeeper and inspector of nautical instruments; Professor H. M. Paul, U. S. N., in charge of magnetic and meteorological observations; Computer M. E. Porter; Instrument-maker William F. Gardner.

The Astronomical Director is Professor William Harkness, U. S. N., and immediately under him are Professor Edgar Frisby, U. S. N., in charge of the 12-inch equatorial refractor; Professor S. J. Brown, U. S. N., in charge of the 26-inch equatorial refractor; Professor A. N. Skinner, U. S. N., in charge of the 9-inch meridian circle; Assistant Astronomer G. A. Hill, in charge of the prime-vertical transit and the alt-azimuth; Assistant Astronomers T. I. King and F. B. Littell; Computers E. A. Boeger, G. K. Lawton, William M. Brown and F. H. Parsons; Photographer George H. Peters.

The 6-inch transit circle is not yet ready for use.

The work of the Observatory since its removal to the new site, in the beginning of 1893, has been as follows:

In 1888 the management of the Naval Observatory acceded to a request from the German Astronomical Society to determine, in accordance with its general program, the positions of the stars in the zone $-13°$ $50'$ to $-18°$ $10'$ of declination. Various difficulties prevented the execution of this work at the old Observatory, but as soon as the 9-inch transit circle was got into working order at the new site the Superintendent, Captain F. V. McNair, directed Assistant Astronomer A. N. Skinner to proceed with the observations, and gave him the assistance of Computers T. I. King and F. B. Littell for that purpose. The first zone was observed January 13, 1894, and with the exception of a few scattering stars, the entire work was completed in 182 zones, the last of which was observed on May 26, 1897. The program involved the determination of the position of 8,689 stars, with at least two observations of each. The number of observations actually made was 19,762, of which 18,062 were zone stars and 1,700 were zero stars. The reduction of these observations is about three-fourths completed. In the course of the zone observations Assistant Astronomer Skinner discovered the variability of the following stars:

X Hydræ, announced in the *Astronomical Journal*, No. 332.

W Ceti, announced in the *Astronomical Journal*, No. 342.

RT Libræ, announced in the *Astronomical Journal*, No. 352.

Z Capricorni, announced in the *Astronomical Journal*, No. 358.

The meridian observations of the Sun, Moon and planets were necessarily interrupted by the removal to the new site. As stated above, these observations were suspended June 29, 1891, and it was not found expedient to resume them until after the appointment of the Astronomical Director in September, 1894. During the progress of the observations of the German zone, other meridian observations could not be pushed energetically, and until the zone reductions are completed they will be limited to the Sun, Moon and planets, the necessary ephemeris stars, and a few miscellaneous stars. The Sun and major planets are now observed on the meridian every day, except Sundays and holidays, and the Moon is observed at every visible transit. The reductions of these observations are nearly completed to within a few months of date.

The 12-inch equatorial has been continuously employed by Professor Frisby on observations of asteroids, comets, occultations

of stars by the Moon, and eclipses of Jupiter's satellites. Much of the current work of this instrument may be found in the *Astronomical Journal.*

The 26-inch equatorial has been continuously employed by Professor Brown on observations of the more difficult asteroids, on double stars, and on the satellites of Mars, Saturn, Uranus and Neptune. In recent months some spectroscopic work has been done.

Assistant Astronomer George A. Hill has charge of the Prime Vertical transit instrument and the alt-azimuth. With the Prime Vertical transit from July 24, 1893, to November 20, 1898, he has made 1,140 observations of α Lyræ, θ Aurigæ, α Canum Venaticorum, μ Andromedæ and γ Bootis. With the alt-azimuth instrument from February 24, 1898, to November 20, 1898, he has made 425 vertical-circle observations of American Ephemeris stars, and from November 22, 1894, to November 20, 1898, he has also made 599 zenith telescope observations of pairs of stars selected in groups as suggested by Küstner.

As at the old Observatory, meteorological observations are taken every three hours by the watchman on duty. After removal to the new site magnetic observations were resumed, but it was soon found that the influence of the suburban electric roads in the vicinity entirely vitiated the photographic records, and they were discontinued in the summer of 1898.

The annual volume of Observations for the year 1889 was published in 1893, and that for 1890 was published in 1895. The latter contained an important appendix entitled 'A catalogue of 16,748 stars, deduced by the Naval Observatory from zone observations made at Santiago de Chili by the United States Naval Astronomical Expedition to the Southern Hemisphere during the years 1849, '50, '51, '52, Lieut. J. M. Gilliss, U.S.N., Superintendent.' Advantage was taken of the interruption of the work of the Observatory by reason of its removal to a new site, to complete the reduction of these zone observations. Among the many persons who have shared in the computations Professors Harkness, Frisby and Brown have performed the most important part.

In November, 1898, was published Appendix I to the Washington Observations for 1892, entitled 'The Second Washington Catalogue of Stars, together with the annual results upon which it is based; the whole derived from observations made at the United States Naval Observatory with the 8.5-inch Transit Circle during the years 1866 to 1891 and reduced to the epoch 1875.0, prepared under the direction of John R. Eastman, Professor of Mathematics, U.S.N.' This catalogue contains the positions of 5,151 stars which have been derived from 72,941 observations, being the entire series made while the Pistor and Martins transit circle was located at the old Observatory.

It will be noted that the Naval Observatory owes its existence primarily to an attempt on the part of naval officers to provide a depot for the care and issue of charts and nautical instruments. This naturally involved the equipment of the Depot with such astronomical instruments as are necessary for rating chronometers, but the needs of the Wilkes Exploring Expedition of 1838 to 1842, and the inception of the American Ephemeris and Nautical Almanac ten years later, soon showed the necessity for an instrumental equipment sufficient to cope with all astronomical problems, and that followed in due time. The principal aim of the Naval Observatory has always been to carry forward a continuous series of Meridian observations on the Sun, Moon and planets, such as can only be undertaken by great government observatories, like those of Greenwich and Paris. Since 1861 this work

has been kept up assiduously, and in recent years the number of meridian observations of the Moon has largely surpassed those made anywhere else.

In spite of this limitation in the scope of its operations, the Naval Observatory has not been unmindful of other lines of work. As instances of this may be cited the brilliant discovery of the moons of Mars by Professor Hall; the extensive work upon the satellites of the outer planets by Professors Hall, Newcomb and Brown; and finally the star catalogues of Professors Yarnall and Eastman and the contribution to the great star catalogue of the German Astronomical Society in the observation of the zone of stars from 13° 50′ to 18° 10′ of south declinations.

A. N. Skinner.
U. S. Naval Observatory.

THE PSYCHOLOGY OF SOCIETY.

The attempt to construct a science of society by means of biological analogies has been abandoned by all serious investigators of social phenomena. It was one of those misdirected efforts that must be looked upon as inevitable in the development of any branch of knowledge. The notion of a universal evolution compelled those who accepted it to try to find some other explanation of our social relations than that dogma of an original covenant which had come down to us from Hobbes and Locke. Biology supplied most of the facts and ideas of which the evolutionary thought was constructed; and naturally, therefore, biological conceptions were first made use of in formal Sociology. At present, however, all serious work in Sociology starts from psychological data, and proceeds by a combination of psychological with statistical and historical methods.

Psychology has had a development somewhat similar. Beginning with purely metaphysical terms and reasonings, it became a natural science with the advent of evolutionary thought, and for a long time drew its best materials and its most fruitful hypotheses from physiological data. Physiological Psychology was the only psychology very well worth attention. George Henry Lewes was one of the first writers to argue, as he did with great force and brilliancy in the 'Problems of Life and Mind,' that the physiological explanations of mind must be supplemented by explanations drawn from the study of society. At the present time the social interpretation of mental development is an important part of psychological activity.

Psychological and sociological investigations have thus converged upon certain common problems, namely: The problem of the social nature of the individual mind, and the problem of the psychical nature of social relations. Any new contribution to either Psychology or Sociology is likely to be found also a contribution to the other, and we may look in the near future for a number of books of which it will be difficult to say whether they are primarily works on Psychology or on Sociology.

This is eminently true of Professor Baldwin's 'Social and Ethical Interpretations,' the second volume of his work on 'Mental Development.' The first volume, on 'Methods and Processes,' was definitely a study in Psychology. The problem dealt with was that of mental development through the interaction of physical and social causes, and the importance of social factors was emphasized throughout. In the volume on 'Social and Ethical Interpretations' we again find the same problem. The development of the individual mind through its social relations and activities is further considered. In this volume, however, the opposite problem also is introduced. The development of social relations and activities through the outgoing of the individual is discussed, and the nature of society is subjected to a critical examination.

A division of the volume into two books corresponds to the above distinction of the problems dealt with. Book I. is a study of the person, public and private; Book II. is a study of society. The four formal parts of Book I. deal respectively with the imitative person, the inventive person, the person's equipment and the person's sanctions. The three formal parts of Book II. deal respectively with the person in action, social organization and practical conclusions.

I shall not attempt in the present article to review Professor Baldwin's treatment of all these subjects, or even to summarize his conclusions. I shall examine only the two conceptions that are of chief interest to the sociologist. These, of course, are the conception of the social nature of the self, or individual personality, and the conception of the psychic nature of society.

Psychology, some time ago, got beyond the conundrum

> "Should I be I or should I be
> One-tenth another and nine-tenths me"

if my great-grandmother had married another suitor? It seems to be agreed on all hands that in any case the ego is nine-tenths or more somebody else. That is to say, his individual personality is for the most part a product of his intercourse with other personalities. Professor Baldwin, as readers of his earlier works are aware, goes even beyond writers like Ribot and James in his account of the composite origin of the self. He holds that not only does the self incorporate elements from other personalities, so that, at any given time, it includes thoughts and feelings derived from others, and acts in imitation of the conduct of others, but also that its very thought of itself is merely one pole of a consciousness 'of a sense of personality generally,' the other pole of which is the thought of some other person or *alter*.

This comprehensive sense of personality at first is merely projective—to use Professor Baldwin's term; it is a mass of more or less vague impressions received from persons who are encountered and observed. It is secondly subjective; the ego, by its imitations of observed persons, incorporates their peculiarities to some extent in itself. It is thirdly ejective; the self interprets observed persons in terms of its own feelings, thoughts and habits. This give and take between the individual and his fellows Professor Baldwin calls 'the dialectic of personal growth;' and he says it may be read thus: "My thought of self is in the main, as to its character as a personal self, filled up with my thought of others, distributed variously as individuals; and my thought of others, as persons, is mainly filled up with myself. In other words, but for certain minor distinctions in the filling, and for certain compelling distinctions between that which is immediate and that which is objective, the ego and the alter are to our thought one and the same thing." Thus the individual is always a socius, and not merely because, after reaching adult life, the necessity of cooperating with his fellow-men compels him to adapt himself to them and to modify an original egoism by the cultivation of social habits, but because, from his earliest infancy, his own development as a self-conscious person has been incorporating social elements and creating within himself a social no less than an individual point of view.

When adult life is reached, however, the process does not cease. The dialectic of personal growth continues to determine all our thinking, our social no less than our individual judgments; that is to say, in arriving at any judgment, we incorporate in our thought the judgments of other men; and we interpret the judgments of other men by our own.

It follows that all of those social relations and policies which are products of

reflection no less than of feeling are determined by the 'dialectic of personal growth,' and that, like judgments of things in general, they are, in the thought of individuals, highly composite products of subjective and ejective views of the same phenomena.

Approaching the study of society in this way, Professor Baldwin is naturally led to discriminate between the substance, content, stuff, or material of society, and the functional method or process of organization of the social material. He criticises the sociologists for not having definitely enough discriminated these two problems. Consistently with his conception of our social judgments, he describes the matter of social organization as follows: "The matter of social organization consists of thoughts; by which is meant all sorts of intellectual states, such as imagination, knowledges and informations." This 'matter,' he thinks, is found only in human groups, which only, therefore, can be called societies. Animal communities he would call 'companies.' The functional method or process of organization of the social material he is satisfied to find in the process of imitation as subjectively contained in the 'dialectic of personal growth,' and objectively described, in sociological terms, by M. Tarde. Social evolution results from the interaction of the individual as a particularizing force and society as a generalizing force. All solidarity and conservation are due to the generalizing force; all variation to the particularizing force. Progress is a dialectic of give and take between these two elements.

In examining these conceptions I shall admit their general or substantial truth, and inquire only whether they need modification, limitation or expansion. Do they sufficiently and precisely express the whole truth and nothing but the truth?

Is the thought of self quite so largely a product of the social relation as Professor Baldwin represents? Is it accurate to say that "my thought of self is, in the main, filled up with my thought of others," even if we admit 'minor distinctions in the filling' and "certain compelling distinctions between that which is immediate and that which is objective?" What are these compelling distinctions of the immediate? Obviously, they are those presentations in consciousness which arise from organic conditions rather than from social relations. Hunger is a state of consciousness which can subvert the entire product of the 'dialectic of personal growth;' and the sociologist is unable to lose sight of the fact that when men who have been developed by that dialectic into socii are confronted by starvation they are liable to have thoughts of self which can hardly be construed as filled up mainly with thoughts of others, unless he is prepared to accept a cannibal's definition of others. The sociologist, then, must continue to think of the individual as being both an ego and a socius, and yet as being at all times more ego than socius.

The importance of this modification of Professor Baldwin's formula is chiefly for purposes of economic theory. No economist will be able to accept Professor Baldwin's contention (bottom of page 13) that it is illegitimate to 'endeavor to reach a theory of value based on a calculus of the desire of one individual to gratify his individual wants, multiplied into the number of such individuals.' The truth is that, for most purposes of economic theory, this procedure is not only legitimate, but is the only one psychologically possible The compelling wants that political economy has chiefly to consider are those which arise from the organic nature and which, therefore, magnify the ego at the expense of the socius.

The modification is necessary also for purposes of ethical theory. Professor Bald-

win, if I rightly understand him, derives all ethical phenomena from social relations. This I believe to be an error. Economic motives are specific cravings of particular organs or groups of organs. Complete satisfaction of economic wants may deprive other organs of their due satisfaction. The protest of the neglected organs and the hunger of the entire organism for integral satisfaction is, I believe, the original source of all ethical motive, which, therefore, is indefinitely developed by, but not initiated in, the 'dialectic of personal growth.'*

It seems probable, then, that in 'the dialectic of personal growth,' the original ego with which the dialectic starts, plays throughout a controlling part; and that, after all, the process of developing a socius is one which consists essentially in modifying, by means of social relations and activities, an originally independent self.

The modification, however, is undoubtedly produced by the process of give and take between ego and alter. The question, then, that I wish next to raise is: Is the give and take, in which the ego engages, carried on indiscriminately with any alter, or is there, from the very beginning of conscious life, a tendency to discriminate between one and another alter, and to limit the conditions of personal growth by that state of consciousness which may be described as a consciousness of similars or of kind? Scattered throughout Professor Baldwin's writings are many intimations that he has suspected, or perhaps even been definitely aware of, such limitations. I do not find, however, that he has anywhere endeavored to formulate them or to bring them systematically within the formulas of his dialectic.

What, then, are some of the inquiries which should be made in regard to these limitations?

* I have considered this subject at greater length in an article on 'The Ethical Motive,' in the *International Journal of Ethics*, April, 1898.

First, I think that we should inquire whether, long before any discriminations of kind have become possible, a preparation for them and a tendency toward them is made in conscious experience. Of the sensations which first arise in consciousness some are received from the bodily organism which the self inhabits; some are received from similar bodily organisms, and some are received from wholly unlike objects in the external world. Now, we know that many sensations received from self are so nearly like sensations received from likeselves that, merely as sensations, they can be distinguished only with difficulty. If, for example, I strike with my voice a certain note of the musical scale, and another person a moment after strikes the same note with his voice, my auditory sensations in the two cases will be very nearly alike. If I cry out in pain, and then hear another man like myself cry out in pain, my auditory sensations will be nearly alike. If, however, I hear a dog bark the sensation will be different from that which I have received from my own voice. If I walk with my friend down the street, and happen to notice the motion of my feet as I take successive steps, and then to notice the motion of my friend's feet, the visual sensations will, in these two cases, be closely alike. If, however, I happen to notice the trotting of a horse that is being driven by me the visual sensation will be different from that which I have received in observing my own steps. If I stroke the back of my hand, and then stroke the back of my friend's hand, I shall receive tactual sensations that are closely alike. If, then, I stroke the fur of a cat or the mane of a horse, or touch the paw of a cat or the hoof of a horse, I shall receive sensations very different from those received from the back of my hand. It appears, then, that before there is any power to make discriminations of any kind, even to think of differences of sensation, sensa-

tions themselves fall into different groupings. At the very beginning of conscious life certain elements which are to enter into a consciousness of kind begin to appear in experience. They consist of like sensations received from self and from others who resemble self.

On the basis of these experiences there are developed others that call for investigation from the same point of view. When suggestion begins to play an important part in mental life are suggestions from persons very unlike self equally efficacious with suggestions from persons nearly like self? There is here a great field for investigation. A thousand familiar observations strongly indicate the superiority of suggestions that come from those whose neural organization resembles that of the person affected. Why, for example, does Maudsley venture to say, without offering the slightest proof, that, while men are as liable as silly sheep to fall into panic when they see panic among their fellows, they are not similarly liable when they perceive panic among sheep? Obviously, because facts of this general character are so familiar that no one would think of questioning them. In like manner, a child who objects to performing a certain task which his father asks him to do will do it without hesitation if he sees other boys in the street engaged in the same work. Phenomena like these, of course, have their origin in a like responsiveness of like organisms to the same stimulus.

A third class of experiences and activities, which are ultimately to enter into a consciousness of kind, and that are already very probably dominating 'the dialectic of personal growth,' are imitations. Here, also, there is room for exact investigation; but we may predict at the outset that investigation will verify the common opinion that we chiefly imitate our similars. The equally familiar fact that we do not always do so is of immense importance for the theory of variation, invention and originality. And this theory, I believe, is not to be constructed without referring back to the truth mentioned above, that the ego is at all times the original and dominant element in the 'dialectic of personal growth.' I am not at present prepared to give my reasons, but I expect that it will be shown that in the same reaction of the organism upon the organ which is the source of ethical motive will be found the source of originality, variation and the occasional imitation of those who differ from, rather than resemble, ourselves.

The factors thus far considered, namely, like responsiveness of like organisms to the same stimulus, like sensations received from self and from others who resemble self, a greater responsiveness to suggestions from like selves than from not-like selves, and a greater readiness to imitate like selves than to imitate not-like selves, together make up the organic sympathy that is a bond of union in those groups of animals that Professor Baldwin calls companies, and the bond of union of men who act together impulsively rather than reflectively—the bond, in short, of the mob. It is certain that organic sympathy depends on organic likeness, and the phenomena that have been named above are the psychological correlatives of organic likeness.

How is organic sympathy converted into a higher or reflective sympathy? The true answer, I think, is: Through the mediation of that perception of resemblance which is the initial stage in the conversion of a mere sensational experience or likeness into a reflective consciousness of kind. When the power to perceive relations and to make discriminations arises, the perception of resemblances and differences among one's fellow-beings becomes an all-important factor in the further development of social relations and in the 'dialectic of personal growth.' From that moment organic sym-

pathy becomes a function of the perception of resemblance; and sympathy becomes, to a certain extent, reflective. Even in mob action the reaction of the perception of kind may be seen with the utmost clearness. When, for example, a mass of men simultaneously respond to a party cry or symbol the action for the moment is merely a like responsiveness to the same stimulus. An instant later, when each man perceives that his fellow-beings are, in this respect, resembling himself in feeling and in action, his own emotion is enormously intensified. It is this which gives to all symbols and shibboleths their tremendous social importance. The phenomenon has been very well described in the concluding pages of Dr. Boris Sidis's 'Psychology of Suggestion.'

Let us pass, now, to the conception of the psychical stuff or substance of society.

Professor Baldwin's thesis, as we have seen, is that "the matter of social organization consists of thoughts, all kinds of knowledges and informations." He thus places himself in definite opposition to those writers who have made sympathy, or any kind of emotion, the psychological stuff of society. It is for this reason that he makes a sharp distinction between animal 'companies' and human societies. Criticism of this thesis may be made from two points of view: one, the historical, supported by observations from animal communities; the other, the psychological, supported by those analyses of the relations of sympathy and perception which I have sketched above. From the standpoint of the observer of animal and primitive human societies it is difficult, if not impossible, to establish a line of demarcation between the more highly organized bands of animals, like troops of monkeys, or herds of elephants, or bands of wild horses, and the simplest hordes of human beings, like Bushmen or Australian Blackfellows. No one can say when, in the development of man from brute, sympathy ceased to be the chief stuff or substance of the social relationship, and thoughts in the form of inventions and knowledges began to assume that important place. In like manner, when modern human society is looked at from the psychological view-point, it is often, indeed usually, impossible to say whether sympathy or thought predominates in the intercerebral action of the associating individuals. Professor Baldwin's thesis would compel him to maintain that the same individuals are a 'society' one day and merely a 'company' another. At one time they are thoughtful and self-controlled; at another time they are an audience swept by emotion, or a mob given over to fury. Shall we, then, say that the stuff of society is thought merely, or feeling merely, or some combination of the two? Surely the last of these possibilities is the one that is most consistent both with evolutionary hypotheses and with psychological conclusions. The substance of society at first is sympathy and instinct mainly. At its best estate society may rise to a level where thought has for the moment completely subordinated feeling. But usually, and throughout the greater part of its career, society is sympathy and instinct more or less organized, more or less directed, more or less controlled, by thought. When the thought element appears society has become reflective, and a better way to mark the distinction between the lowest and the highest societies than that which restricts the word 'society' to the latter and calls the former 'companies' is one which indicates this element of reflection. Animal and primitive human communities are, for the most part, sympathetic or non-reflective societies; progressive human communities in general are reflective societies. The reflective stage corresponds to the appearance of the perception of kind and to reflective sympathy.

But even if we were to accept the thesis that the social stuff is exclusively intellectual we could not possibly admit that it

consists of all sorts of thoughts and knowledges indiscriminately. It undoubtedly includes all sorts of thoughts and knowledges, but not all sorts of thoughts and knowledges in and of themselves make society or the social stuff. The social stuff, so far as it is intellectual, is one kind of knowledge in particular, namely, knowledge of resemblances, knowledge of those modes of like-mindedness that make cooperation possible. The same logic that leads Professor Baldwin to try to separate the social stuff from other kinds of stuff should lead him further to distinguish the thought that is essentially social and capable of organizing all other thoughts and knowledges into social material from the thought and knowledge that have no such inherent power.

Perhaps, however, it is in his few remarks about the social process that Professor Baldwin has been most unjust to himself, and has missed an opportunity to make a really important contribution to social science. He is willing to grant that the social process consists in imitation. Yet, if the earlier chapters of 'Social and Ethical Interpretations' prove anything at all, they prove that imitations are progressively controlled, as individual development proceeds, by the process of ejective interpretation. To carry this thought into sociological interpretation it is necessary to bear in mind the function of resemblance, especially of mental and moral resemblance, in controlling relationships. In the ejective processes of the 'dialectic of personal growth' not all of our acquaintances are indiscriminately utilized. We detect the difference between those who, in ways important to ourselves, resemble us and those who, in ways important to ourselves, differ from us. Our ejective interpretations, therefore, are accompanied at every step by a process of ejective selection. These ejective selections are the psychological basis of all social groupings, not only of those of the more intimate sort, such as personal friendships, but those also of the purely utilitarian sort, like business partnerships. In a word, while imitation is a process that penetrates society through and through, it is not a distinctively social process. It is wider than the social process, just as thought is more comprehensive than the social stuff. The distinctive social process is an ejective interpretation and selection. In its widest form it includes imitation controlled by or made a function of ejective selection.

I may now very briefly indicate the further criticisms which, in pursuance of this thought, must be made upon Professor Baldwin's views—criticisms, namely, that apply to his treatment of social policy. No exception is to be taken to the analysis which describes the individual as the particularizing social force, and society in its entirety as the generalizing social force. But I fail to discover in Professor Baldwin's account of the subject any adequate recognition of the social causation of individuality. That causation must be sought in the phenoma of unlikeness in the social population. Throughout human history individuality and the possibility of social variation have been due to the commingling of ethnic elements, or, within the same nationality, to the commingling of elements long exposed to different local environments. The commingling itself is brought about by emigration and immigration. If the biological phenomenon of panmixia is all that Weismann, Galton and other investigators have represented to be, its levelling effects are counteracted and social progress is made possible only by continual groupings and regroupings in the population under the influence of ejective selection.

Finally, there is no possible explanation of social policy which leaves out of account the facts of mental and moral resemblance and the consciousness of kind. Without like-mindedness there can be neither spon-

taneous nor reflective cooperation. Not only must there be an agreement of thought, but for most, if not for all, public cooperation there must be a vast mass of sympathies and agreeing emotions. Men must have like sensations, be similarly sensitive to suggestion from resembling fellows, and enter subtly into like judgments without always being fully conscious of the process by which their conclusions are reached. The greater part of all public action must be described as a consequence of sympathetic and half-reflective agreement in plans and purposes, rather than as a consequence of systematic deliberation Moreover, it must not be forgotten that all public policy is a means to an end, proximate or ultimate; and that the ultimate end in every case is the maintenance and development of a certain type of man. That type itself is a mode of resemblance; and the recognition of it, which directs and controls all policies, is a mode of the consciousness of kind.

FRANKLIN H. GIDDINGS.

ATOMIC WEIGHTS.

THE following table of values is recommended for general adoption in analytical practice by a commission appointed by the German Chemical Society consisting of H. Landolt, W. Ostwald and K. Seubert. (Ber. d. D. Chem. Ges. *1898*, 31, 2761.)

The commission recommends that:

1. The atomic weight of oxygen be taken as 16.000, and that the atomic weights of the other elements be calculated on the basis of their combining ratios with oxygen, directly or indirectly determined.

2. The following atomic weights of the elements be adopted in practice, as they are probably the most correct values known at the present time.

These numbers are, as a rule, given only with so many decimals that even the last one may be regarded as accurate. In consequence, the atomic weights determined by Stas, in which the errors amount to from 3 to 6 units in the third decimal, are given with two decimals; the other atomic weights which have been more accurately determined are given with one decimal, and those less accurately determined are given without decimals. Exceptions to this rule have been made only in the cases of nickel, bismuth and tin, marked with an asterisk in the table.

Name.	Symbol.	Atomic Weight.	Name.	Symbol.	Atomic Weight.	Name.	Symbol.	Atomic Weight.
Aluminium	Al	27.1	Helium (?)	He	4.	Rubidium	Rb	85.4
Antimony	Sb	120.	Hydrogen	H	1.01	Ruthenium	Ru	101.7
Argon (?)	A	40.	Indium	In	114.	Samarium (?)	Sa	150.
Arsenic	As	75.	Iodine	I	126.85	Scandium	Sc	44.1
Barium	Ba	137.4	Iridium	Ir	193.0	Selenium	Se	79.1
Bismuth	Bi	208.5*	Iron	Fe	56.0	Silicon	Si	28.4
Boron	B	11.	Lanthanum	La	138.	Silver	Ag	107.93
Bromine	Br	79.96	Lead	Pb	206.9	Sodium	Na	23.05
Cadmium	Cd	112.	Lithium	Li	7.03	Strontium	Sr	87.6
Cæsium	Cs	133.	Magnesium	Mg	24.36	Sulphur	S	32.06
Calcium	Ca	40.	Manganese	Mn	55.0	Tantalum	Ta	183.
Carbon	C	12.00	Mercury	Hg	200.3	Tellurium	Te	127.
Cerium	Ce	140.	Molybdenum	Mo	96.0	Thallium	Tl	204.1
Chlorine	Cl	35.45	Neodymium (?)	Nd	144.	Thorium	Th	232.
Chromium	Cr	52.1	Nickel	Ni	58.7*	Tin	Sn	118.5*
Cobalt	Co	59.	Nitrogen	N	14.04	Titannium	Ti	48.1
Columbium	Cb	94.	Osmium	Os	191.	Tungsten	W	184.
Copper	Cu	63.6	Oxygen	O	16.00	Uranium	U	239.5
Erbium (?)	Er	166.	Palladium	Pd	106.	Vanadinum	V	51.2
Fluorine	F	19.	Phosphorus	P	31.0	Ytterbium	Yb	173.
Gallium	Ga	70.	Platinum	Pt	194.8	Yttrium	Y	89.
Germanium	Ge	72.	Potassium	K	39.15	Zinc	Zn	65.4
Glucinum	Gl	9.1	Præsodymium (?)	Pr	140.	Zirconium	Zr	90.6
Gold	Au	197.2	Rhodium	Rh	103.0			

In the case of nickel this was done in order to emphasize the difference between the atomic weights of cobalt and nickel, although in both values there may be possible deviations of ± 0.2. The true atomic weights of bismuth and tin are not correct to a certainty, to within 0.1. The value of hydrogen is 1.008, correct to within 0.001, but the approximation of 1.01 has been regarded as permissible for the requirements of practice, as it involves an error of only one-fifth of one per cent. The values given for the elements marked in the table with interrogation points are not necessarily exact within whole units of the atomic weights assigned.

Ferdinand G. Wiechmann.

JOHN CUMMINGS.

In the decease of Hon. John Cummings, of Woburn, Mass., on the 21st of December, there terminated a life which has been noteworthy for the encouragement it has given to the study and teaching of science. In the early part of his manhood days Mr. Cummings acquired a reputation for honorable dealing and for his success in the manufacture of leather in his native town of Woburn. To that town he was always loyal and generous, but his intelligence and his activity led him into larger circles until he became favorably known and his influence was felt in a large and populous community. He became acquainted with the late William B. Rogers, for whom he always cherished an admiration and a profound regard. He also knew Louis Agassiz, Jeffries Wyman, Asa Gray and others, and he soon became a student as well as a lover of nature. The offices of trust and of business responsibility which he filled make a long and notable list, but his large affairs did not prevent him from cultivatiug a love for science, and they aided him in multiplying his gifts to the cause of education. Through his attachment for William B. Rogers he was interested in the founding of the Massachusetts Institute of Technology, and he became one of its most substantial supporters, contributing to its financial needs and serving as its Treasurer for 17 years. It was through his generosity that the Boston Society of Natural History started its 'Teachers' School of Science,' and it was through his liberality that its botanical collection was developed and that it has received special care to the present day. He was actively and generously interested in the work of public instruction, and he extended his aid to the South after the close of the Civil War. In one instance he purchased a building and supplied teachers, urging them to work for the establishment of free public schools, and when this was about to be accomplished he donated the building to the cause. His gifts and his efforts were never calculated to attract attention to himself, and many of his good deeds were scarcely known even by his friends. He was one of a class of honorable and broad-minded business men who have been magnanimous in their support of science education, and who have found time to participate in the acquisition of knowledge, while aiding others to means for the prosecution of their studies or investigations.

Wm. H. Niles.

SCIENTIFIC BOOKS.

Matter, Energy, Force and Work. By Silas W. Holman, Professor (Emeritus) Massachusetts Institute of Technology. New York, The Macmillan Company.

Lovers of exact science are already indebted to Professor Holman for numerous important contributions to our knowledge of physics and especially for valuable suggestions as to the best treatment of the experimental solution of physical problems. His most pretentious work thus far is that on 'Precision of Measurements,' which is everywhere recognized as a standard and which ought to be in the hands of every

one who is preparing to do something in the way of experimental research. In the volume now under consideration he has entered a different field, and with such success as to deserve and, I have no doubt, to win the approval of all interested in the fundamental principles and concepts of physical science. In addition to an excellent review of current theories of the nature of matter, energy, force, etc., in which the vortex theory and Le Sage's theory of gravitation are exceptionally well presented, the work includes much that is new and original, a few proposed additions to the nomenclature of science and many extremely suggestive discussions.

Professor Holman departs from the usual practice in the very beginning when he defines matter as 'the inert constituent of substance.' By 'substance' he means 'that which is inferred as existing in space, and as endued with powers to affect portions of itself,' and it is made out of matter by the addition of something. 'Continuous, uniform and permanent occupancy of space' is the ultimate and sole property of matter. 'Mass' is defined as 'quantity of matter,' and as matter has really no significance until it becomes 'substance' the word 'mass' is practically banished.

Atoms are 'permanent aggregations of matter differentiated from matter by some mode of motion' (vortex motion), and they combine to make 'substance.' 'Bodies' are limited portions of 'substance.' The 'something' which distinguishes *substance* from *matter* is *energy*. "A designated quantity of substance consists of a definite quantity of matter in permanent association with a definite quantity of energy or motion." The two words 'or motion' render this statement somewhat obscure. What is meant by a 'definite quantity of motion?' Professor Holman's definition of 'motion' is that of nearly all writers, namely, 'change of relative position.' It is a curious but common practice to define it in this way and then to define its 'quantity' by associating with it something (matter, mass) absolutely unlike it in every respect. It is certainly not in this sense that he means to use it in the phrase above quoted.

To all 'substance' he attributes a 'capacity for kinetic energy' and to this capacity he applies the term '*kinergety*,' of which much use is made in all subsequent discussions. Mass is *assumed* to be proportional to *kinergety* and the latter thus affords a means of measuring the former or rather of comparing different quantities of it.

Quantities of substance may also be compared by means of the force called 'weight,' and a quantity thus determined by means of the equal-arm balance is called *weightal*.

The 'International Kilogramme' and the 'Imperial Pound' are spoken of as standards of 'Kinergety' and *weightal* is shown to be proportional to 'Kinergety.' What is commonly known as 'the ether,' the medium by which radiant energy is transmitted, is regarded as a kind of substance, and hence *not* the continuous uniform substratum of 'matter' from which all substance is evolved.

It is impossible in a brief notice to make extensive quotations, but especial attention ought to be invited to the author's remarks on the various forms of energy. They are extremely interesting and suggestive, and particularly so in the exhibit which is made of the importance of the energy of elasticity as an intermediate stage of all energy transformations. The definition of 'force' as related to energy will not fail to attract attention and possibly enable many readers to possess a reasonably satisfying concept of that much-abused word. Reference has already been made to the very full presentation of the vortex theory of matter, in the possibilities of which the author evidently has great confidence. The principal results of the splendid work of Professor J. J. Thomson in the application of this theory to chemical phenomena are here given in clear and simple language, without the mathematical backing upon which it leans. The singularly clear and satisfactory discussion of Le Sage's theory of gravitation as affected by the vortex theory of atoms would alone put the volume on the shelves of every physical library, but the more distinctly original portions of it, the nature of which has only been hinted at in this notice, will fully justify its careful perusal by students of physical science.

I think there can be no impropriety in a brief

word in reference to the circumstances under which this book was written. It is well known among his many friends that Professor Holman's active participation in the work of the Rogers Laboratory of Physics was arrested two or three years ago by the development of an illness from which, unfortunately, he has not yet recovered. During this time he has been confined to a reclining chair, and, in his own characteristic words, 'even the familiar utilization of the convenient gamut of ether waves' has been denied. Although unable to move and unable to see, his courage has never faltered. There has been no loss in his power of thought, and he has gone on thinking the many fine things which he has put into this book, for which, even if it had not been prepared under conditions that would have defeated most men, all physicists, friends and strangers alike, will ever be his debtor.

T. C. M.

A Brief Course in Qualitative Analysis. By Ernest A. Congdon, Ph.B., Professor of Chemistry in the Drexel Institute. New York, Henry Holt & Co. 1898.

The method of treatment adopted in this book consists in giving, first, a clear, concise statement of the most important reaction for each metal and acid, and then tables giving one or more schemes of analysis for each group. The tables are supplemented by explanatory notes. At the end of the book a series of questions, well designed to test the student's grasp of the subject, are given. While the tabular form always has the advantage of presenting the scheme for analysis very clearly, in the opinion of the writer, the same object is better attained by a tabular record prepared by the student. Because of their concise form, tables necessarily omit many details which are essential for the successful execution of an analysis, and the notes which follow do not entirely overcome this difficulty.

The selection of reactions and of schemes for analysis is excellent, and in the hands of good teachers the book will prove a useful one.

A Short Manual of Analytical Chemistry, Qualitative and Quantitative, Inorganic and Organic, following the Course of Instruction given in the Laboratories of the South London School of Pharmacy. By John Muter, Ph.D. Second American Edition. Illustrated. Adapted from the Eighth British Edition. Philadelphia, P. Blakiston's Sons & Co. 1898. Pp. xiii + 228. Price, $1.25.

As the title implies, a very large amount of information is compressed into comparatively little space in this volume. In the qualitative portion the statements giving the deportment of metals and of acids toward reagents are given consecutively and are followed by tables of schemes for analysis. Then follow directions for the identification of alkaloids and of a number of common organic compounds. The quantitative portion includes volumetric and gravimetric analysis, ultimate organic analysis, and directions for the examination of air, water, food, alcoholic liquors, etc. It is in this portion that American chemists will find most to criticise; Gooch crucibles are nowhere described, not even for the cases where they should be used in place of weighed filters. Directions for the determination of 'citrate soluble phosphoric acid' are not given under the analysis of 'manures,' and no reference is made to the 'official methods.' The old uranium acetate method is given for the volumetric estimation of phosphoric acid instead of the more satisfactory methods with a reductor or with a standard alkali. Metaphenylene diamine is recommended for the detection of nitrites in water analysis, although the reagent is not sufficiently sensitive to be of any practical use in many cases. But, while the authors do not appear to be conversant with the best American practice in these and some other cases, and while some of the directions appear to be too much abbreviated for the satisfactory use of a beginner, it would be difficult to find another book which compresses so much information about analysis into so small a space and for so moderate a price.

W. A. Noyes.

Wild Animals I have known. By Ernest Seton Thompson. New York, Charles Scribner's Sons. 1898. Square 12mo. Pp. 359. 200 illustrations. Price, $2.00.

Rarely are the qualities of naturalist, writer and artist combined in one person, but Mr.

Ernest Seton Thompson has won distinction in all three rôles. As a naturalist he has enjoyed opportunities for study and observation both in Canada and the United States, chiefly in Ontario, Manitoba and New Mexico. As a writer he is known as the author of 'Birds of Manitoba,' 'Mammals of Manitoba,' and numerous articles contributed to magazines and scientific journals. As an artist he is perhaps still more widely known through his 'Art of Taxidermy,' and work in illustrating several popular books on natural history, more especially on birds.

His latest book is original in conception and execution. Here he has brought together some of his most interesting adventures and field experiences, woven them into entertaining and instructive stories, and illustrated them in a manner entirely unique. Under the title of 'Wild Animals I have known' Mr. Thompson has departed from the beaten path of natural history description, and given us an insight into the habits and daily lives of some of the lower animals with which he has been on more or less familiar terms. He describes his friends from what might be termed the human standpoint, *i. e.*, not as mere objects, but as individuals endowed with personality and reason. "What satisfaction," he asks in the prefatory note, "would be derived from a ten-page sketch of the habits and customs of Man? How much more profitable it would be to devote that space to the life of some one great man. This is the principle I have endeavored to apply to my animals."

The book consists of eight stories detailing the adventures of Lobo, King of Currumpaw; Silverspot, a crow; Raggylug, a rabbit; Bingo and Wully, two dogs; The Springfield fox; the pacing mustang; and Redruff, a partridge. Lobo was a large wolf well known to the cattlemen of northern New Mexico who suffered from his depredations; Silverspot, an old crow, has received his name on account of a conspicuous white spot on the side of his head; Raggylug, a rabbit with a ragged ear. Each animal and bird had some peculiarity by which it could be readily distinguished and thus kept under observation, sometimes for several years. The stories are told in a delightfully interesting style and contain many new facts and observations. Nearly all end tragically, for, as the author explains, the end of a wild animal is usually tragic. The book is not, and is not intended to be, a scientific treatise on mammals. The reader is assured that the stories are true, but this does not necessarily imply that every detail was based on actual observation. In fact, it would be practically impossible to observe some of the scenes depicted in the biographies of the rabbit and the fox. In describing the habits of a particular animal there is little more than a skeleton of fact on which to build. The record is so fragmentary that an author is compelled to fill in the gaps from his general knowledge of the species and to represent the characters as he conceives them to be. Such descriptions are of necessity composite and subject to personal equation and imagination.

The book is copiously illustrated with 29 half-tone plates and a large number of marginal sketches. The type bed is narrow and the margins are utilized for sketches which are sometimes mere outlines or suggestions, but so skillfully executed as to make it possible to follow certain parts of the story merely by the illustrations. No one can fail to notice the author's careful attention to details and his skill in woodcraft. The student of natural history will find many things of interest in the descriptions and illustrations, and the general reader will not regret an introduction to some of the animals Mr. Thompson has known.

T. S. P.

Human Anatomy. Edited by HENRY MORRIS, M.A. Philadelphia, P. Blakiston's Sons & Co. 1898. Second Edition.

The appearance of a revised and enlarged second edition of this work within less than six years from its original entry into the arena is in itself a sign of success. The well-known text-books of human anatomy which have held almost undisputed sway since the memory of the oldest teacher, continually enlarging their field with the lapse of years, are so strongly intrenched that the prospects of a new rival at first can hardly have appeared hopeful. Not only have they done their work very well, but their methods have become so familiar to teachers, and the latter have got so habituated to

them, that a new text-book is like a new pair of shoes, which have to be broken in before they can be called a comfort to their owners. There can be no question that this process is likely not to be a very rapid one. It is clear that this book has stood this preliminary test. It is written by several authors, but is fairly homogeneous. The aim is to disregard microscopic anatomy and to offer a text book which shall present the facts of gross anatomy both in a practical and in a scientific way. It is needless to say that the latter requires references both to embryology and to comparative anatomy. The section on the bones by Sutton is remarkably well done. When we say that the joints are the work of the editor we have said enough to vouch for excellence—to all, at least, who know his earlier monograph (now unhappily out of print) on that subject. The peritoneum is the work of Treeves, which, again, is saying enough. We mean no slight to the other able writers whom we do not more particularly mention. The first edition concluded with a section on surgical and topographical anatomy which cannot but be welcome. In the present edition this is followed by a too short chapter on vestigial and abnormal structures. Variations of the muscles, of the vessels, and some of those of bones are considered in their respective sections. The book is a very good one. We could, perhaps, find flaws here and there, but a search for them is uncalled for, as most of our readers are not professed anatomists. We have but one serious criticism to make, namely, that in the section on the nervous system the most recent (but generally accepted) fundamental doctrines of the structure of that system have not received due recognition.

The illustrations are a most important part of a text-book on anatomy. We are happy to give these very high praise. We were on the point of making special mention of those of certain sections, but they are so good as a whole that we refrain.

To what extent this book will displace old and established favorites the future will show. It is a matter eminently unsafe to prophesy about, but the success already attained is, no doubt, an earnest of future progress.

Thomas Dwight.

GENERAL.

The proceedings of the forty-seventh meeting and fiftieth anniversary of the American Association for the Advancement of Science have been sent to members by the Permanent Secretary, Dr. L. O. Howard. The volume, which contains introductory matter extending to 83 pages and 658 pages of text, appears very promptly, the address of President Eliot given before the Association on 'Destructive and Constructive Energies of our Government compared,' being here printed before the January issue of the *Atlantic Monthly*, which also contains it.

Lady Welby has printed for private circulation a pamphlet extending to 61 pages, entitled 'The Witness of Science to Linguistic Anarchy.' The introduction opens with the statement: "The following collection of extracts, chiefly from *Nature*, Science and *Natural Science* have been selected from a much larger number, with the object of bringing together, in convenient form, evidence of an almost incredible state of things in the scientific world." We find an interesting collection of quotations on scientific nomenclature, showing a certain amount of diversity and conflict. Still they scarcely bear witness to a 'paralyzing nightmare of impotence,' and it does not follow as suggested by Professor Foster that an international tribunal should 'stamp the coin of science' by defining every new name. New words must come and language must be flexible if science is to grow. Certainly men of science should realize their responsibility and be careful in their use of terms, but words were made for science and not science for words. Those interested can probably obtain a copy of Lady Welby's pamphlet by addressing her at Denton Manor, Grantham, England.

We have received for review a copy of 'Life's Comedy,' Third Series (Charles Scribner's Sons). *Life*, from the issues of which this Christmas book is a reprint, does not hesitate to leave its own field and display ignorance by attacking men of science who practice vivisection, which should warn us against tresspassing on foreign territory. As *Punch* treats the anti-vivisectionists from the point of view that commends itself

to men of science, we may be prejudiced, but it does seem that 'Mr. Punch' is always a gentleman, whereas *Life* is on occasion distinctly vulgar.

THE Rev. J. G. Hagen, of the Georgetown College Observatory, announces that the first series of charts of his Atlas of Variable Stars is nearly printed and will be issued in a few weeks. The cost of engraving and printing the whole Atlas will be about $7,000 and, though one-fourth of this sum has been given by Miss Catherine Bruce, it is necessary that one hundred subscribers to the entire series be obtained in order that expenses of engraving and printing can be guaranteed and its completion secured. The present series contains twenty-four charts and is sold to subscribers to the whole series at one Mark per chart. The work is published by Herr. F. L. Dames, of Berlin, but subscriptions may be sent through the Harvard College Observatory or through the Georgetown College Observatory.

SCIENTIFIC JOURNALS AND ARTICLES.

Terrestrial Magnetism for December, 1898, contains the following articles: 'Report of the Permanent Committee on Terrestrial Magnetism and Atmospheric Electricity to the International Meteorological Conference;' 'The Toronto Magnetic Observatory,' R. F. Stupart; 'The Attitude of the Aurora above the Earth's Surface' (concluded), C. Abbe; 'Bigelow's Solar and Terrestrial Magnetism,' reviewed by Arthur Schuster; 'Notes on the Magnetic Storm of November 21st–22d, and on the Secular Motion of a Free Magnetic Needle,' by L. A. Bauer. Mr. Stupart in his article describes the new Toronto Magnetic Observatory, situated at Agincourt, nine miles northeast of the old and disturbed site. Beginning with March, 1899, the name of the journal is to be changed to *Terrestrial Magnetism and Atmospheric Electricity.* It has been found necessary to enlarge the periodical somewhat, and, in consequence, the subscription price has been increased from $2 to $2.50. It will be conducted, as heretofore, by L. A. Bauer and Thomas French, Jr., both of the University of Cincinnati. The editors will be asssisted by Messrs. Eschenhagen (Potsdam), Moureaux (Paris), Littlehales (Washington), Schuster (Manchester), Elster and Geitel (Wolfenbüttel), McAdie (New Orleans), and by an international council consisting of Rücker (England), von Bezold (Germany), Mascart (France), Rykatschew (Russia), Mendenhall and Schott (America).

The American Journal of Science for January contains the following articles:

'Thermodynamic Relations of Hydrated Glass,' by C. Barus; 'Platinum and Iridium in Meteoric Iron,' by J. M. Davison; 'Studies in the Cyperaceæ,' by T. Holm; 'Regnault's Calorie and our Knowledge of the Specific Volumes of Steam,' by G. P. Starkweather; 'Estimation of Boric Acid,' by F. A. Gooch and L. C. Jones; 'Descriptions of imperfectly known and new Actinians,' with critical notes and other species, II.; by A. E. Verrill; 'Mineralogical Notes,' by W. F. Hillebrand; 'What is the Loess?' by F. W. Sardeson; 'Absorption of Gases in a High Vacuum,' by C. C. Hutchins.

Appleton's Popular Science Monthly for January gives as a frontispiece a portrait of August Kekulé and a sketch of his life and contributions to science follows. Among the other articles in the number are 'The Mind's Eye,' by Professor Joseph Jastrow, illustrating the part played by mental processes in visual perception; an argument by Professor G. T. W. Patrick, maintaining that children under ten should not be taught to read and write; and nature study in the Philadelphia Normal School, by Mrs. L. L. W. Wilson.

SOCIETIES AND ACADEMIES.

THE NEBRASKA ACADEMY OF SCIENCES.

THE ninth annual meeting of the Nebraska Academy of Sciences was held at Lincoln, November 25 and 26, 1898.

The address of the retiring President, Dr. H. B. Ward, was upon the 'Fresh-water Biological Stations of the World.'

These were divided into individual resorts for independent investigation, periodical resorts where groups of scientists go for a portion of the year, and permanent stations where work is carried on throughout the year by resident investigators. The best results can only be expected in the latter class, which are necessarily under government protection.

On the evening of November 25th, after a banquet tendered to members of the Academy and their wives by the Lincoln members, an address was given before the Academy by Professor Lawrence Bruner, on the 'Flora and Fauna of Argentina, S. A.,' where he has spent the past year investigating a grasshopper plague.

Professor Bruner first gave a few facts regarding the location and shape of Argentina, its climate and the effect of the climate on plant and animal life. A very large portion of Argentina has an average of less than eight inches of rainfall per annum; another portion has an average rainfall of from eight to twenty-four inches, while another has from twenty-four inches to sixty. Still all this territory is inhabited and is well supplied with plant and animal life. Here evolution in plant and animal life is most noticeable, every form of vegetation and all kinds of animal life changing as the climate changes in traveling from one portion of the country to the other. Argentina was a conntry where everything protected itself and was fitted by nature to do so. The trees had thorns, the grasses and weeds were provided with thorns, and pointed, sharp blades and herbaceous plants were shielded with burrs. In the dryest parts of Argentina Professor Bruner said he had found plant and animal life abundant. Forests of large trees could be found where rain was scarcest, and he had been told that when heavy rains fell the trees would die from too much moisture. Many forms of animal life thrived best where there was no moisture. Plants were found without leaves, and birds of the same order as our water fowl that avoided water. In no other country on the earth, excepting perhaps Australia, could forms of animal life be found that compared with what was to be found there. Many kinds of birds were provided with spurs on their wings, and to illustrate some of these wonders the stereopticon was introduced and a number of views of strange animal life shown.

Other papers on the program were as follows: 'Methods of Collecting and Preserving Water-Mites,' by Dr. Robert H. Wolcott, with exhibition of new forms of collecting apparatus. 'The Discovery of the Southern Maidenhair Fern in the Black Hills,' by Dr. Charles E. Bessey. It had been reported to him that it grew there in profusion, but as its northern limit was about 36 degrees, or the southern line of Missouri, he took a thousand-mile journey that he might be able to state scientifically that it was there. He found it growing in profusion on the banks of a stream fed by warm springs, beside the buffalo berry of the north.

C. J. Elmore read the second chapter of his serial, begun last year, on 'The Second Year's Flora of a Dried-up Millpond,' and was requested to continue the subject next year.

'One to One Correspondence,' by Dr. Ellery Davis. 'A Determination of the Latitude of the Observatory,' by Professor G. D. Swezey. The reduction of fifty-nine observations for the latitude of the observatory on the University grounds, made with a small universal instrument, gave as a result $40° 49' 9.''9 \pm 0.''4$. Over a hundred additional observations have been taken which have not yet been reduced.

A joint paper by Abel A. Hunter and G. E. Hedgecock on 'Thorea,' a seaweed found by Mr. Hunter in the northeastern part of Lancaster county the past summer, was submitted. This very rare and exceedingly interesting seaweed is now found for the first time in Nebraska and the second time with certainty in North America.

'What is Phytogeography,' by Dr. Roscoe Pound. A discussion of the province of phytogeography and of the various names that have been used to designate this and other closely related lines of investigation.

'The Growth of Children,' by Dr. William W. Hastings. Observations made in European cities and in the larger cities of this country, with the results of experience in the University and public schools of Lincoln. From two to sixteen years the growth of children is very regular, but from sixteen to seventeen it is retarded. The full growth of man does not cease until after he is twenty-five. Athletics extend the growing period to thirty years. Affluence increases and deprivation and hard work decreases the growth. Size diminishes between the age of fifty and sixty. The speaker mentioned the phenomenal increase of five and seven-eighths inches chest measure in a 15-year-old boy, but the discussion brought out the fact that his grade marks were only seventy-five.

Ernest A. Bessey, in 'How some Pistils close up,' gave a study of the pistils of the buttercup and larkspur.

'Observations on the Leonid Meteors of 1898,' by Professor G. D. Swezey. Observations made simultaneously at Lincoln, Crete and Beatrice, from which the heights and actual paths of a number of the meteors was determined.

A. B. Lewis read a paper on 'The Occurrence of a Fresh-water Nemertine in Nebraska,' which described a marine animal which has been discovered in fresh water near the round house.

Miss Carrie Barbour showed geodes from the Bad Lands, formations which are called by the cowboys blossom-stones.

Notes on the 'Falling of Leaves from a Cottonwood Tree,' by C. J. Elmore, described a tree sixteen inches in diameter and forty-five feet high. The cottonwood was shown to adapt itself to climates and conditions and to be unaffected by the change of seasons.

Dr. R. H. Wolcott, of the zoological department, read a paper on 'The Hydrachnidæ of Nebraska.' He had already found sixteen new species and one new genus.

The geology of Lincoln's surroundings, as described last year by C. A. Fisher, was illustrated by charts and outlines by Miss Barbour.

The following papers were read by title only: 'Botanical Notes for the Year 1898,' by Dr. C. E. Bessey. 'Fossil Bryozoans of Nebraska,' by Mr. G. E. Condra. 'Some new Grasshoppers and other related Insects from Argentina,' by Professor Lawrence Bruner. 'A new Bird Tape Worm,' by Mr. Geo. E. Condra. 'On the Poisonousness of Pure Water,' by Dr. A. S. von Mansfelde.' 'Obituary of Professor Wells H. Skinner;' by Mr. A. T. Bell.

The following persons were elected to honorary membership in the Academy: Alexander Agassiz, LL.D.; John M. Coulter, LL.D.; Professor Samuel H. Scudder; Joseph Le Conte, LL.D.; Simon Newcomb, LL.D.; Dr. Otto Kunze; Professor Victor Hensen.

The election for officers resulted as follows: President, Professor G. D. Swezey, of Lincoln; Vice-President, Dr. H. Gifford, of Omaha; Secretary and Custodian, Professor Lawrence Bruner, of Lincoln; Treasurer, G. A. Loveland; Directors, Professor Charles Fordyce, of University Place, and Professor J. H. Powers, of Crete; Professor H. Brownell, of Peru.

SCIENCE CLUB OF NORTHWESTERN UNIVERSITY, EVANSTON, ILLINOIS.

AT the December meeting of the Science Club, of Northwestern University, Professor A. R. Crook, of the department of mineralogy, read a paper on 'Notes on Russian Geology.'

Until within recent years the number of Russians working in geology has been insignificant. The results of their work have for the most part been published in a language inaccessible to non-Russians. The police barrier erected by the government against travelers has kept out foreign geologists. Hence our knowledge of Russian geology has been meagre. The meeting of the International Geological Congress in St. Petersburg was an event of great importance. A hundred workers from other lands visited mines and formations from one part of the country to the other, and thus gained a personal knowledge of Russian geology, an acquaintance with the tasks and methods of work of Russian geologists, and an inclination to learn the Russian language. Russian geology offers interesting material in paleontology, mineralogy and general geology. The first contains less of importance than the last two.

The topaz, turmaline, emerald, alexandrite, phenacite, amethyst, rhodonite, malachite, platinum, gold and a hundred other less valuable minerals found in the Urals shed light upon the association, occurrence and genesis of minerals, while exhibiting the species in most perfect form.

The crystallines and eruptives of Finland and the Urals, the question of the Silurian in the Urals, the development of the Permian, the Carboniferous of South Russia, the igneous rocks of the Caucasus, together with their present glaciers, and the glacial deposits which cover the larger part of Russia, court investigation and attract the petrologist, the glaciologist, the stratigrapher, the physiographer, the paleontologist.

Natural and cut gems, maps and lantern slides were used in illustration.

WM. A. LOCY,
Secretary.

THE CHEMICAL SOCIETY OF WASHINGTON.

THE regular meeting was held on November 10, 1898.

The first paper of the evening was read by Mr. F. K. Cameron, and was entitled 'Some Boiling-point Curves for Mixtures of Miscible Liquids.' The general properties and significance of pressure-concentration and temperature-concentration curves for pairs of perfectly miscible liquids were indicated, and the researches of Konowaloff, Nernst and others briefly cited. All the possible types now known were illustrated by some as-yet-unpublished data from a preliminary investigation by Cameron and Thayer. A significant fact brought out by certain of these curves, notably the one for alcohol-chloroform mixtures, is that they possess not only a maximum and minimum point, but there is a decided sag in the opposite direction at another portion of the curve. So far no such curve is known which has both a maximum and minimum point, and the possibility of such a case has been denied by some authorities. But the fact just cited shows an indubitable tendency towards such a case and indicates that by a suitable choice of the constant factor (temperature or pressure) for some pair of liquids such a curve may yet be found. The great desirability of further experimental work in this field, both for theoretical and practical reasons, was indicated.

The second paper was by Mr. F. K. Cameron, and was entitled 'A Ternary Mixture.' Given a mixture of two perfectly miscible liquids, A and B, and a third substance, C, soluble in one constituent of the pair, at a definite temperature there will be a separation of the liquid mixture into its constituents, this definite temperature being dependent on the relative concentrations of the solution. By keeping C in excess of the amount soluble the problem is somewhat simplified. The results of a preliminary investigation on the curve for temperature of separation-concentration, presence of a third substance soluble in only one constituent, were presented. Further, the third substance, C, was varied for certain concentrations. And, finally, mixtures of the substances which had been used as C were tried. The results were interesting, but no causal connection could be detected. It is essential that more experimental evidence shall be in our possession before a satisfactory theory of the phenomena will be possible.

The third paper was read by Dr. T. M. Chatard and was entitled 'Note on the Rate of Loss in Cyanide Solutions.' Dr. Chatard exhibited a sheet of curves representing the rate of loss of cyanide in solutions used for the extraction of gold in the electrolytic sluice. There is always a certain loss due to oxidation of the cyanide through agitation of the solution during the operation of the apparatus. Another loss results from the action of the ore on the solution. An electric current of about 0.2 amp. per sq. ft. of cathode plate and of about 2 volts is employed, and it is desirable to know what effect such a current has upon the solutions which usually contain from 0.20 to 0.25 per cent. KCN at the start. Samples of the solution were taken at regular intervals during each run, the percentage of cyanide giving points of the curve. When ore is treated, the curves usually show a rapid loss of cyanide during the first period of fifteen minutes, due to the action of the ore, the rate of loss then decreasing so that the final result is often a fairly regular curve. When the solution is run with neither ore nor current the fall in strength is usually regular, so that the line connecting any three consecutive points is practically straight. Using the customary current but no ore, other conditions being alike, the results indicate that the cyanide losses are lessened even though the tests are, as yet, too few for positive evidence. It may, however, be stated with confidence that the use of electricity, so important for the extraction of precious metals from ores and solutions, is not attended by any increased loss of the expensive cyanide.

The last paper was read by Dr. C. E. Munroe and was entitled 'The Examination of Acid for Use in the Manufacture of Gun-cotton.' Dr. Munroe's paper contained a summary of work done by his assistants, Mr. G. W. Patterson and Mr. J. J. Tobin, and by him. The specifications for the acids given were accompanied by descriptions of the analytical methods and methods of calculation to be followed in the inspection of the acids supplied, and a com-

parison was made between these methods and others that have been proposed. Attention was called to the necessity of defining the substances present by the methods by which they are to be determined and reckoned, as it not infrequently happens that there are differences of opinion as to the form in which they occur and the methods for determining them, and a dispute is most easily avoided by a prior technical convention. Thus there is a difference of opinion as to the form in which a portion of the nitrogen present in these acids occurs, some regarding it as in the form of hyponitrous acid, others as nitrosulphuric acid, but without expressing any opinion on this point the specifications simply required that it should be determined in a carefully prescribed manner and reckoned as N_2O_4, and that as thus determined and reckoned it should not exceed a certain percentage of the mixture. The data of a considerable number of analyses showing the percentage composition and specific gravities of both original acids and spent acids from the guncotton manufacture was given, and the differences between the amounts of sulphuric acid in the different operations was seen to be remarkably constant, showing the mixture to be well proportioned for this purpose. Observations were made on the permanency of composition of the mixed acids stored in darkness and in sunlight; on the color of the acids as a criterion of the amount of nitrogen oxides present; on the change of color produced by heating them; on the freezing of the acids and the rate of expansion of different mixtures. The specific-gravity bottle used, which was devised by Professor Barker, and which was particularly adapted to this work, was exhibited.

WILLIAM H. KRUG,
Secretary.

HARVARD UNIVERSITY: STUDENTS' GEOLOGICAL CLUB, DECEMBER 6, 1898.

MR. P. S. SMITH described 'An Occurrence of Corundum in Kyanite.' This paper will be published soon in full. Mr. J. M. Boutwell spoke on 'Tides: Their Character and Cause.' After reviewing our incomplete knowledge of tides in the open ocean, he explained a method of expressing, with plotted curves, certain facts obtained from observations on tides, as they traverse continental shelves and estuaries. These curves show a perfect homology between wind waves and true tidal waves in form, range, length (better termed breadth) and velocity. Under the cause of tides, the main points of the explanation advocated by Hagen, Airy, Darwin and others were presented.

Geological Conference, December 13, 1898.—In a communication entitled 'Dikes and Veins,' Professor Shaler considered the origin of fissures occupied by these bodies. Field observation near the Spokane Placer, Montana, shows that intrusives part rocks along bedding planes more readily than transverse to them. Professor Shaler suggests that water, mechanically included in beds at the time of their deposition, becomes heated by an approaching, intrusive mass; and that by expanding it opens the way for the intrusion along previously existing, structural planes. According to this theory, in a region where the intrusives are of different age, the earliest intrusive should show evidence of its easy entrance along fissures opened by expanded water; and subsequent intrusives should exhibit signs of more difficult entrance, owing to the exhaustion of assisting waters.

Mr. Robert DeC. Ward presented 'Some Observations on the Médanos of Peru,' which will be published in a future issue of this JOURNAL.

J. M. BOUTWELL,
Recording Secretary.

TORREY BOTANICAL CLUB, NOVEMBER 30, 1898.

ON discussion of enlargement of the program for excursions, it was arranged that field meetings be provided on Saturdays after the first of January, for the purpose of studies of cryptogams and of winter stages of higher plants.

The first paper was by Mr. Marshall A. Howe, 'Remarks on some Undescribed Californian Hepaticæ,' and consisted of the description of three new species, soon to be published. Beautiful plates illustrating these species were exhibited, the work of Mr. Howe, to form part of the forthcoming volume of the Memoirs of the Torrey Club.

The second paper was by Professor Francis E. Lloyd, on 'The Nucleus in Certain Myxo-

mycetes and Schizophyceæ.' Mr. Lloyd remarked that the work of Strasburger (1884),and later of Lister, gives evidence that the nucleus of the Myxomycetes is a definite organ possessed of a nuclear membrane and containing chromatin. During cell-division the chromatin is segregated into rounded masses lying in the nuclear plate. A spindle is formed. After the formation of a fine nuclear membrane the spindle fibres gradually disappear. The small number of these parallel fibres and absence of a cell-plate led Strasburger to compare the nucleus to the animal rather than the plant type. Precisely similar conditions are, however, found in some plant cells.

The presence of a nucleus in the Schizophyta has been a point of controversy. Bütschli asserts the nuclear character of the central body, and regards the red granules as chromatin. A. Fischer denies the accuracy of the former's conclusions, the question remaining an open one. When our knowledge is complete it is highly probable that the nucleus will be found to be of the distributed type, of a type, therefore, comparable to that of the simpler protozoa. In any case the nucleus of the lowly plants is much more primitive than that of the Myxomycetes. We are led, therefore, to regard these curious, much-debated forms, the Myxomycetes, as either plants of a higher type than the Schizophyta, which have degenerated, or as animals related probably to the sporozoa. For the former view there is now little evidence.

The Secretary addressed the Club briefly regarding the discarded species *Aster gracilentus*, T. & G., and exhibited its type specimen, which formed a sheet of the herbarium of M. A. Curtis, now at Princeton, and was exhibited through the courtesy of Professor George Macloskie, of that University.

Mr. Howe exhibited a number of examples of Wolffia, discovered floating in Van Cortlandt Lake, constituting the third recorded collection within New York State of this minutest of flowering plants.

Dr. Rusby exhibited a Paulownia blossom in which half an anther had grown on the outside of the corolla. Dr. Britton reported two interesting additions to the collections of the New York Botanic Garden: 1st, a valuable collection of photographs illustrating the cultivation of the poppy in Asia Minor; and 2d, a gift to the Garden from Mr. Peter Barr, the English horticulturist, of a collection of *Narcissus* and *Pæonia* for planting in the Botanic Garden. The claim of free entry as museum material was at first refused by the New York custom house; but, after five different appeals, the final decision was that the material was proper to an outdoor museum, and free entry was granted.

Edward S. Burgess,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE PUMAS OF THE WESTERN UNITED STATES.

A recent examination of Rafinesque's description of *Felis Oregonensis* (*Atlantic Journal*, Vol. 1, No. 2, page 62, summer of 1832) brings up an interesting question as to the relationship of this name and those recently proposed by Dr. C. Hart Merriam for the Pumas of our Western States.

Rafinesque in the above article describes two species. The second of these is *Felis macroura*, based on an account in Leraye's Travels, of an animal resembling the Conguar of the Alleghanies, but not larger than a cat, 'with tail as long as the body, which is from one to two feet long only.' The source of this information is unreliable and the probability is that no such animal existed.

The first species described is, however, of more importance. Rafinesque's description is as follows:

"1. Var. *Oregonensis.* Dark brown, nearly black on the back, belly white; body six feet long, three high, tail two or three feet long. A large and ferocious animal of the mountains. Is it not a peculiar species? *Felix* [sic] *oregonensis.*"

In the introductory paragraph of the article he says: "In addition to the article on our Couguars, page 19, I have to state that several other varieties of tygers are found in the western wilds of the Oregon mountains, or east and west of them, which deserve to be noticed. I find in my notes that two other varieties of Couguar have been seen there east of the mountains."

The *Felis macroura*, he states distinctly,

dwells on the plains east of the Oregon mountains, but no definite locality is given under the description of *F. oregonensis*.

The indefiniteness of the opening paragraph where the forms are stated to occur, both east and west of the mountains, makes this name apparently applicable to either the Puma of the Rocky Mountains or the Northwest coast region. However, the fact that the other species (*macroura*) is said to occur *east* of the mountains, gives this form the benefit of whatever the use of the word 'west' was intended to imply, and, furthermore, the dark color which is distinctly pointed out would seem to fix the name *oregonensis* on the Northwest coast form.*

Dr. Merriam, in Proceedings of the Biological Society of Washington, July 15, 1897, p. 219–220, proposed the name *Felis hippolestes* for the Puma of the Rocky Mountains, and *Felis hippolestes olympus* for the Northwest coast form, apparently overlooking the paper by Rafinesque.

In view of the evidence here set forth, it seems that Rafinesque's name must be recognized, and I would, therefore, suggest that the proper names for the two animals should be

Felis oregonensis (Raf.) Northwest Coast Puma.

Felis oregonensis hippolestes (Merr.) Rocky Mountain Puma.

WITMER STONE.

ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA, December 9, 1898.

*'Oregon' of this date, of course, included the present State of Washington and much of British Columbia.

THE SCHMIDT-DICKERT MOON MODEL.

THE installation of the Schmidt-Dickert relief model of the moon in a scientific institution deserves, perhaps, a passing notice. This seems the more desirable since in so generally accurate a work as 'Webb's Celestial Objects for Common Telescopes,' edition of 1896, the statement is made that this model is in Bonn. It has not been in Bonn for fully twenty years, and for most of that time has been in this country.

While occasionally exhibitions have been made of the model during this time they have been of short duration and in different cities, so that, for this time at least, it has been practically lost to the world. Through the generosity of Mr. Lewis Reese, a citizen of Chicago, the model has now come into the possession of the Field Columbian Museum and has lately been installed in this institution. It is now, therefore, freely available for purposes of study and instruction. Since it has been so long lost from view some facts regarding the model may be of interest. It was constructed in 1854 by Th. Dickert, Curator of the National History Museum in Bonn, under the direction and with the cooperation of Dr. J. F. Julius Schmidt. The name of the latter is of itself sufficient guarantee of the accuracy and perfection of detail exhibited by the model, especially as Dr. Schmidt states that he tested with his own hand the accuracy of nearly all the measurements. So much labor was necessary in order to insure accuracy in the details that the work of modelling and construction occupied five years. The model is in the form of a hemisphere, 18 Paris feet (19.2 English feet), in diameter. Its horizontal scale bears the ratio to that of the moon of 1:600,000, the vertical 1:200,000. It is made up of 116 sections, each 15 degrees in length by 15 degrees in breadth. The consecutively joined edges of these sections serve to mark upon the surface of the model, parallels and meridians. The different colors exhibited by different parts of the moon are also depicted upon the model, the prevailing color being a dull yellow, broken by gray-green where the 'seas' occur, and by representations in lighter yellow of the bright streaks which radiate so prominently from some of the craters. The orientation which has been adopted for the model is the normal one of the moon, not inverted as it is when seen through an astronomical telescope. The north pole of the hemisphere is therefore above, the south pole below; east is to the left, and west to the right. The surface details of relief shown upon the model are based upon the charts of Beer and Madler, but many new localities were added from the observations of Dr. Schmidt himself. In all over 20,000 distinct localities are represented, modelled proportionally according to the relief which they present upon the moon. One may, therefore, study the relief with the greatest confidence that the actual topography of the moon is represented, and is spared the confusion arising

from the varying effects of shadows which make the study of the moon itself possible only to specialists. With the advance which has taken place in the interpretation of topographic forms in the last twenty years, it seems not too much to hope, now that this model has been made accessible to students of science, that its study will bring to light new facts regarding the nature and history of our satellite..

Oliver C. Farrington.
Field Columbian Museum, Chicago.

LEHMANN AND HANSEN ON 'THE TELEPATHIC PROBLEM.'

To the Editor of Science: I can assure Professor James that I do not knowingly leave unread anything that he or Professor Sidgwick writes. I carefully considered the two papers to which he refers, at the time of their appearance, and have recently turned to them again. I am afraid, however, that I cannot make the admission that Professor James expects. Even if I granted all the contentions of criticism and report I should still see no reason to change the wording of my reference to Lehmann and Hansen. But there is a great deal that I cannot grant. While, like Stevenson's Silver, 'I wouldn't set no limits to what a virtuous character might consider argument,' I must confess that, in the present instance, the grounds for such consideration have not seldom escaped me.

Professor James rules that the *Phil. Studien* article is 'exploded.' I have tried to take up the position of an impartial onlooker; and, from that position, I have seen Professor James and Professor Sidgwick and Herr Parish handling the fuse, but I have not yet heard the detonation.

E. B. Titchener.

ASTRONOMICAL NOTES.

THE NOVEMBER METEORS.

Reports of meteor observations made this year between the 11th and 16th have been published from England, France and the United States. These are sufficient to show the characteristics of the display and to furnish hints as to the methods which should be followed in future years. The greatest number of meteors was noted on the morning of the 15th (civil reckoning), when the rate reached two each minute at some stations in the United States. A single observer could count forty or more per hour. It is probable that the maximum had already passed, as more meteors were noted on the preceding than on the following night at the few stations where the skies were clear on those nights. On the 14th a single observer at Lyons, France, noted 134 between 1:04 a. m. and 4:05 a. m. On account of the cloudy weather at Paris M. Janssen made a balloon ascension and observed above the clouds. We are told that this plan of securing clear skies will be used more extensively next year. The number observed this year is fully ten times as great as those observed in 1897 and is about the same as that noted at Grenwich in 1865, the year preceding the great shower of 1866. This augurs well for the year 1899.

Observers report several interesting facts: (1) Many meteors with the characteristics of the Leonids did not proceed from the radiant area within the 'Sickle of Leo.' The discrepancies in locating the radiant point are not to be wholly explained by the errors to which all eye estimates of meteor tracks are liable, but are in part real. (2) The radiant area has for its center a point which is farther south than that calculated from the observations of 1866, which was R A. 10 h. 0 min., Decl. + 22°.9. The records this year, as far as known, range between 9 h. 50 min. and 10 h. 20 min. in R. A. and + 18° to 22° in Decl. A preliminary determination from the photographed trails of four meteors made at Harvard Observatory gives 10 h. 6.8 min., Decl. + 22°16′. (3) There were very few brilliant meteors compared with the total number. At Providence fourteen only out of nearly five hundred were brighter than the first magnitude.

The practicability of the photographic method of studying meteors needed no demonstration, but its possibilities are greater than was supposed. An ordinary camera, such as those in use by amateurs, will photograph the brighter meteors. Thus one with an aperture of only one inch and focal length of nine inches, if carefully focussed, will give trails of meteors as bright as the 0 magnitude. The camera need

not be driven by clockwork if the time of the appearance of the brightest meteors in the region towards which the camera is directed is noted. For then the exact positions of the comparison stars in their curved trails while the plate is exposed is known. Amateur assistance in meteor photography is, therefore, valuable. Of still greater value is the photographic record by the larger instruments. Not only can the paths of the meteors be located with accuracy and the position of the radiant points determined, but special characteristics of the trails may be studied. Thus the Harvard Circular, No. 35, mentions that the light attained a maximum and then diminished as rapidly as it increased; that sudden changes due to explosions are well shown; that the trail is sometimes surrounded by a sheath of light, and that in one case the trail remained after the meteor had passed. That these characteristics, which have been noted visually heretofore, should now submit to a permanent photographic record shows that photography will have a large place in this branch of astronomical study.

CHASE'S COMET (J. 1898).

THE discovery of this comet on the plates exposed at New Haven, on the radiant region of the Leonids, is the most interesting episode of the meteor observations. The photographic brightness was estimated to be equal to a star of the 11th magnitude, but it was much fainter in a visual telescope. It was hoped that it might be connected with the meteor stream, but its orbit shows that it simply chanced to be in that direction when observed. The preliminary orbits thus far published are unusually discordant, perhaps due to the combination of the photographic and visual determinations of position.

STELLAR MOTIONS.

PROFESSOR W. W. CAMPBELL, of the Lick Observatory, in the publications of the Astronomical Society of the Pacific, announces the rapid movement towards us of two stars, η Cephei and ζ Herculis. From four photographs of their spectra he determines a relative velocity of 53.9 miles per second for the former and 43.7 for the latter. Allowing for the motion of the solar system, these figures are reduced to 46.0 miles per second and 33.5 miles per second respectively.

WINSLOW UPTON.

BROWN UNIVERSITY,
December 16, 1898.

CURRENT NOTES ON ANTHROPOLOGY.

THE AMERICAN HERO-MYTH.

Two studies have lately appeared on the widely diffused myth of the 'culture-hero' in America. The one is by the Count de Charencey, on the legend of Huitzilopochtli, printed in the *Proceedings* of the French Association for the Advancement of Science, 1897; the other is by Dr. Franz Boas, reprinted from the *Memoirs* of the American Folk-lore Society, Vol. VI., and treats of the Salish Raven Myth and others from the Northwestern tribes.

All these myths are strikingly alike in many details, and both these writers agree that 'it is inconceivable that they originated independently.' Hence Dr. Boas claims that the various raven and coyote tales have a common source; and with precisely the same and equally strong arguments M. de Charencey shows that the myths of the Mayas and Nahuas originated in eastern Asia.

To my thinking, not the similarities (for these we should expect from the constitution of the human mind), but the differences in such myths are what should command our chief attention.

THE PRIMITIVE SAVAGE.

'WAS primitive man a modern savage?' is the question asked by Dr. Talcott Williams in the Smithsonian Report, just issued, and answered by him in a constructive negative. To Dr. Williams, primitive man was a peaceful, happy creature, knowing not war or cannibalism, with a 'surprising primitive development,' which later on degenerated into civilization. This early man enjoyed 'a juster conception of the divine' than his descendants. His gods were peaceful, communication free, hospitality open. "The earth was still empty and happy and young."

If Dr. Williams intends this as a pleasant, humorous sketch, it will pass; if a serious inference from the ascertained facts of prehistoric

investigation, its author is about a century behind time, as every student of the actual remains of earliest man knows the painful but irrefutable evidence of his worse than barbarous, his really brutal, condition, apart from all comparisons with modern savages.

A BOOKLET ON ETHNOLOGY.

Dr. Michael Haberlandt is a 'Privatdocent' in the University of Vienna and also Curator of the Ethnographic Collection in the Royal Museum of that city. A few months ago there appeared from his pen a duodecimo treatise on Ethnography which offers much the best summary of the science which I have anywhere seen. Of its 200 pages half are devoted to general principles, those which belong to 'Ethnology;' and the remainder to descriptive ethnography. Both are characterized by thorough familiarity with the facts, and careful, independent reflection on them. The introduction discusses, with remarkable clearness, the principles of social degeneration and evolution.

Just such brief, clear, up-to-date books as this are what we need in anthropology in this country. It is better to write them than to translate them, and it is unfortunate that we still lack them. (*Völkerkunde*, G. F. Goschen, Leipzig. 1898.)

D. G. Brinton.
University of Pennsylvania.

SCIENTIFIC NOTES AND NEWS.

In the present issue of Science—which opens a new volume—the short notes are placed at the end, in the part of the number which is the last to be printed. These notes should contain reliable, prompt and full information, and men of science in America and abroad are requested to contribute items of news whose publication will forward the objects of this Journal.

The Paris Academy of Sciences has awarded its Lalande prize to Dr. S. C. Chandler, of Cambridge, Mass., and the Damoiseau prize to Dr. George W. Hill, of Columbia University.

Professor G. W. Farlow, of Harvard University, has been elected President of the American Society of Naturalists. Professor H. C. Bumpus, of Brown University, to whom the recent growth and successful meetings of the Society have been in large measure due, has resigned the Secretaryship and is succeeded by Professor T. H. Morgan, of Bryn Mawr College.

Professor R. S. Woodward, of Columbia University, has been elected President of the American Mathematical Society in succession to Professor Simon Newcomb.

Professor John Dewey, of the University of Chicago, has been elected President of the American Psychological Association.

The office of Mr. W. T. Hornaday, Director of the New York Zoological Park, has been moved from 69 Wall Street to the Park, Southern Boulevard and 183d Street, and communications should now be sent to this address. The offices are temporarily established in the Elk House, near the southwest corner of the Park.

The Rev. Dr. Bartholomew Price, Master of Pembroke College, Oxford, and until last year Sedleian professor of natural philosophy, died on December 29th in his 81st year. He was the author of works on dynamics and on the calculus.

Dr. John B. Hamilton, formerly Surgeon-General of the U. S. Marine Hospital Service, editor of the *Journal of the American Medical Association* and professor of surgery at the Rush Medical College, Chicago, died at Elgin, Ill., on December 24th.

Dr. William Munk, the well-known London physician, died on December 20th, aged 73. He was formerly Librarian of the Harveian Library of the Royal College of Physicians and author of the Roll of the College and other works, both of a biographical character and on medical subjects.

The New York Section of the American Chemical Society was able to receive the Society at its recent New York meeting in the Chemists' Club, newly established in the building at 108 West 55th Street. The club-house contains a large assembly room for meetings, smaller rooms and accommodation for the library, which it is expected will be deposited there. The President of the Club is Professor Charles F. Chandler, of Columbia University.

The Royal Institution, London, was founded

in 1799 and will this year celebrate its centenary by special exercises, the character of which has not yet been announced.

THE Boston Medical Committee has awarded its prize to Dr. Guy Hinsdale, of Philadelphia, for an essay on Acromegaly, which has just been published. For 1900 two prizes are offered by the Committee: (1) A prize of one hundred and fifty dollars for the best dissertation on 'The Results of Original Work in Anatomy, Physiology or Pathology,' the subject to be chosen by the writer. (2) A prize of one hundred and fifty dollars for the best dissertation on 'The Method of Origin of Serpentine Arteries and the Structural Changes to be found in them; Their Relation to Arteria-capillary Fibrosis, Obliterating Endarteritis and to Endarteritis Deformans.' Dissertations on these subjects must be sent on or before January 1, 1900, to the Secretary of the Committee, Dr. W. F. Whitney, Harvard Medical School, Boston, Mass.

THE Paris Academy of Medicine has held its annual public meeting for 1898 and awarded the large number of prizes at its disposal. No less than forty prizes were given, not including a large number of medals.

DR. NOLAN has presented to the Philadelphia Academy of Natural Sciences, as a memorial of the late Dr. Joseph Leidy, five volumes of biographical notices, portraits, autograph letters and original drawings. The first volume contains several addresses and articles prepared on the occasion of Dr. Leidy's death and other interesting biographical material. The second volume contains botanical drawings and notes and the remaining three volumes zoological drawings and notes. The volumes are carefully indexed.

AT the next meeting of the British Medical Association, which will be held at Portsmouth from the 1st to the 4th of August, the address in medicine will be given by Sir Richard Powell and the address in surgery by Professor Alexander Ogston.

AMONG those who will give Friday evening discourses before the Royal Institution, London, during the present season are Lord Rayleigh, Professor H. L. Callandar, Mr. Victor Horsley, Professor H. S. Hele-Shaw and Professor Dewar, who will give the first lecture on January 20th, on Liquid Hydrogen.

THE English papers contain details of the meeting to further the objects of the National Association for the Prevention of Consumption, held at Marlborough House on December 20th. The Prince of Wales presided, and addresses were made by Sir William Broadbent, Sir Granger Stewart, President of the British Medical Association, Dr. Moore, President of the Royal College of Physicians of Ireland, Sir James Sawyer, Dr. Andrew, President of the Royal College of Physicians of Edinburgh, and Professor McFadyean. The Marquis of Salisbury moved the following resolution: "This meeting desires to express its approval of the effort which is being made by 'The National Association for the Prevention of Consumption and other Forms of Tuberculosis' to check the spread of the diseases due to tubercle, and to promote the recovery of those suffering from consumption and tuberculous disease generally. It also commends the method adopted by the Association of instructing public opinion and stimulating public interest rather than the advocacy of measures of compulsion." This resolution was seconded by Sir Samuel Wilkes, President of the Royal College of Physicians, and carried unanimously. Remarks were made by Lord Rosebery, Mr. Walter Long, M. P., and the Prince of Wales. It was announced that the London partners of Werner, Beit & Co. had contributed £20,000 for the erection of a sanitarium to be administered by the Association.

ACCORDING to cablegrams to the London *Times*, Colonel Lawrie, Plague Commissioner in Haidarabad, gave evidence on December 19th before the Plague Commission. He stated that the first indigenous case occurred in January, 1897. The measures adopted were evacuation, disinfection, and the burning of floors and walls in kilns. Haffkine's fluid was not a serum, but a putrescent organic liquid containing micrococci of putrefaction and occasionally pathogenic organisms. It was, therefore, directly against modern medicine and antiseptic surgery to inject the fluid. Inoculation had not been

adopted. The burning process was found satisfactory as a means of destroying the plague. Mr. Stevens, Deputy-Commissioner, said that 68 villages in Haidarabad territory had been attacked during 1898. Disinfection by burning in kilns had absolutely destroyed all germs. No bacteria were found in the ashes; the plague never reappeared, and the villages were completely disinfected by the kilns. The plague fugitives were sent back in charge of the police. The classes most affected were low-caste Hindus. Mohammedans were not so liable to infection, nor were the herdsmen, who lived in the open air. Age and sex made no apparent difference. Captain Johnson, on December 20th, described experiments which had been made to determine whether living organisms were found in Haffkine's fluid. Out of six bottles five showed a distinct growth; the other was doubtful. Mazhar Husain, a native practitioner, stated that in the villages in the Naldrug district corpses and their appendages were burnt where such a course was not forbidden by religion; in other cases the dead bodies were buried eight feet deep. The kiln process was adopted with all houses irrespective of individual infection. After the evacuation the fall in mortality was striking. The villages were reoccupied two months after the cessation of deaths. No case occurred among infants. Fair success was obtained by treatment with red iodide of mercury pills. Colonel Lawrie, recalled, expressed his willingness to use Haffkine's fluid if it were rendered sterile, provided it was proved to retain its prophylactic power under those conditions. He admitted that the fluid as now used afforded considerable protection, but denied that it gave immunity. Sterilization, he thought, might render it useless. The plague returns for the second week in December showed a further rise for Bombay city and district, and also for Madras and the Central Provinces. There was a considerable fall in the returns from Mysore.

UNIVERSITY AND EDUCATIONAL NEWS.

In addition to the million dollars given by Lord Strathcona for the endowment of the Royal Victoria College for Women, McGill University and the endowment of a chair of history by Sir William MacDonald, already announced in this Journal, we are informed that at the same time Lady Strathcona and the Hon. Mrs. Howard each gave $50,000 for the Faculty of Medicine and that the Board of Governors of the University gave $200,000 for general endowment.

At a recent conference on secondary education convened by Victoria University at Owens College, Manchester, on December 3d, a resolution was passed recommending that the education department should be represented by a Minister of Education of Cabinet rank.

Governor Roosevelt will, it is understood, serve actively on the Board of Regents of the University of the State of New York, of which he is *ex-officio* a member, and will accept the Chairmanship of the Committee on the State Library. Recent Governors of the State have neglected this duty.

At Trinity College, Cambridge, the Coutts Trotter studentship of the value of £250 for the promotion of original research in natural science, open to graduates of the College not being Fellows, has been divided between H. H. Dale, B.A. (zoology and physiology), and the Hon. R. J. Strutt, B.A. (physics), both scholars of the College.

Dr. Eugen Dubois has been called to a professorship in geology in the University of Amsterdam. Dr. Kippenberger has been appointed professor of chemistry in the University of Breslau. Dr. Wagner has qualified as docent in physical chemistry in the University of Leipzig and Dr. Weinschenk in mineralogy and geology in the Polytechnic Institute at Munich. In the University of Paris, M. Vidal de la Blache has been appointed professor of geography and M. Seailles has been made professor of philosophy. M. Lacour has been made associate professor in the Faculty of Science at Nancy. In University College, London, Mr. W. G. Savage has been appointed as assistant in the department of bacteriology and Mr. G. Bertram Hunt, M.D., has been appointed assistant in the department of pathological histology.